Street Earnings Activation Delay

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Abstract

Street earnings are non-GAAP earnings, adjusted for consistency with the analyst majority basis and disseminated by forecast data providers (FDPs). We find that the time it takes an FDP to incorporate street earnings in its products (activation delay, hereafter) reflects variation in the difficulty of constructing street earnings, investor demand for timely street earnings, and FDPs' limited attention and resources. Furthermore, the market reaction to reported earnings is more timely when activation delay is shorter, and price discovery is highly concentrated during the hour after street earnings are activated. Finally, activation delay increases the delay with which street earnings are incorporated in analyst forecasts. We conclude that frictions in information processing prevent market participants from instantaneously constructing and incorporating street earnings in their decisions, and that FDPs play a key role in alleviating these frictions.

Keywords: street earnings, forecast data providers, information processing delay, price discovery, market reaction timeliness, analyst responsiveness.

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1 Introduction

Street earnings are non-GAAP earnings, adjusted for consistency with analysts' consensus forecast basis and distributed by forecast data providers (FDPs, henceforth). A vast literature examines their properties and capital market consequences and concludes that, on average, street earnings inform rather than mislead investors.[1] While some studies acknowledge the involvement of FDPs in non-GAAP reporting (Lambert, 2004; Abarbanell and Lehavy, 2007; Black et al., 2017), the role of FDPs in constructing and distributing street earnings in capital markets is largely unexamined.

Absent frictions in information processing in capital markets, the role of FDPs merits little attention as street earnings are instantaneously constructed, disseminated, and impounded in prices. In fully efficient markets, while some investors may face frictions and find it cost effective to rely on FDPs for street earnings information, market prices are set by investors who do not face any frictions. In contrast, our thesis is that information frictions prevent street earnings information from being instantaneously produced and acted upon in capital markets, and that FDPs play a key role in alleviating these frictions.

Firms disclose quarterly earnings through numerous channels: newswires, regulatory filings, corporate web sites, and social media (Blankespoor et al., 2014). We argue that monitoring all these channels to obtain reported earnings, adjusting reported earnings for consistency with analysts' forecasting basis, and maintaining a dataset of street earnings actuals are costly activities that are most efficiently performed by FDPs rather than other intermediaries or investors for at least two reasons. First, these tasks are similar to FDPs' tasks of ensuring that a common forecasting basis underlies the consensus earnings forecast and maintaining a database of earnings forecasts. Second, the value of earnings forecasts is likely enhanced when paired up with street earnings actuals, since both measures are needed to calculate unexpected corporate performance. As such, FDPs have strong incentives to quickly determine and disseminate street earnings actuals.

[1] See Black et al. (2017) for a comprehensive survey of the non-GAAP reporting literature.

Our empirical investigation of the process by which street earnings are produced and revealed in capital markets is guided by two basic questions: (1) What determines the delay with which FDPs report street earnings? (2) To what extent do investors and analysts rely on FDPs to determine street earnings? To answer these questions, we use Thomson Reuters' (TR) Institutional Brokers' Estimate System (I/B/E/S) because TR is a major provider of street earnings, and because we can identify the precise time when a street earnings actual has been made available for distribution to I/B/E/S subscribers (i.e., activation time). We measure street earnings activation delay as the time (in minutes) between an earnings announcement and the activation of the EPS actual in the I/B/E/S database.

Analyzing a sample of 67,908 quarterly earnings announcements made between 2006 and 2015 for which we can obtain precise press release timestamps, we document that the mean (median) street earnings activation delay is 594 (44) minutes. Delay is increasing in task difficulty as captured by the number of items commonly excluded from GAAP earnings to construct street earnings, as well as the absolute value of the difference between GAAP and street earnings. These effects are economically large as a one standard deviation increase in either of the measures corresponds to an incremental delay of around 46 minutes. Furthermore, activation delay is decreasing in the extent of management's non-GAAP discussion in the press release, as well as management's EPS guidance, suggesting that these disclosures simplify FDPs' task of constructing street earnings.

We also examine how TR processes announced but unactivated earnings, a direct measure of TR's work backlog. Building on prior research examining investors' processing of competing earnings announcements (Hirshleifer et al., 2009; Frederickson and Zolotoy, 2016), we analyze whether TR queues street earnings activations based on firm visibility. Consistent with TR prioritizing street earnings activations of firms that are more visible, we find that a one standard deviation increase in TR's work backlog increases the street earnings activation delay by 171 (104) minutes when firm visibility is one standard deviation below (above) the sample mean.

To address the question of whether investors rely on TR for street earnings information, we adopt a difference-in-difference (DID) approach which exploits an exogenous change in TR's processing of earnings. Specifically, prior to September 2009, earnings actuals of companies reporting unexpected charges or gains were temporarily "held out" from TR products to see if the majority basis would change going forward. After September 2009, this practice was completely eliminated, significantly increasing the timeliness of street earnings activations for affected firms.[2] To the extent that the market relies on TR for street earnings information, we expect to observe a greater increase in market reaction timeliness after September 2009 for companies that report unexpected charges or gains (the treated sample) relative to those that do not (the control sample).

We define market reaction timeliness as the speed with which prices adjust to earnings information in the [0, 5] trading-day window following the earnings announcement (e.g., Butler et al., 2007; Bushman et al., 2010; Twedt, 2016; Lyle et al., 2017; Drake et al., 2017). We calculate the buy-and-hold abnormal return of each day in the [0, 5] window, scaled by the buy-and-hold abnormal return over the entire six-day window after the earnings announcement, and use the area under the curve formed by this series of ratios as an estimate of market reaction timeliness. Consistent with investors relying on TR for street earnings information, we document a significant increase in average market reaction timeliness in the treated sample relative to the control sample. We perform multiple placebo tests, where we randomly manipulate assignment to the treatment and control samples as well as the timing of the methodology change, and find that our results are specific to the methodology change.

We acknowledge that TR's 2009 methodology change may coincide with unobservable changes in investors' independent processing of earnings, and that the dramatic increase in the timeliness of TR's processing - from an average delay of 1,438 minutes in the pre-2009 period to around 120 minutes in the post-2009 period - raises questions about investors' reliance on TR in recent years. To alleviate these concerns, we perform intra-day price dis-

[2]Section 4.1 provides more details on the 2009 TR methodology change.

covery tests in the post-2009 period. Similar to Dong et al. (2015); Li et al. (2015), and Akbas et al. (2018), we divide the two-day announcement window centered on the earnings press release into 15-minute intervals and regress the portion of the announcement-window return concentrated in a given 15-minute interval on lead and lag activation indicators. We find robust evidence of incremental increases in price discovery during the 15-minute window subsequent to TR street earnings activation, as well as a relative increase in price discovery during the hour immediately following activation compared with the preceding hour, consistent with investors continuing to rely on TR to process street earnings information in the post-2009 period.[3]

Finally, we test whether TR's street earnings activation delay leads to additional analyst forecasting delays following earnings announcements.[4] Although analysts independently analyze earnings announcements and conference calls to determine their own earnings surprise, they likely rely on TR to determine the consensus earnings surprise, both useful in assessing quarterly performance and forming expectations of next quarter performance.[5] To establish causality, we instrument TR's delay in activating firm i's earnings with the number of firms that are in TR's work backlog but are not covered by the analyst, motivated by the idea that an analyst is only "distracted" by firms in her coverage universe. As expected, we find that TR's activation delay leads to forecasting delay. Specifically, a one standard deviation increase in instrumented activation delay leads to an incremental average forecasting delay of approximately 5.4 hours.

Our study extends the literature on street earnings in several ways. Conceptually, we offer a simple framework that emphasizes the role of information frictions in the production

[3]In the Internet Appendix, we demonstrate that our model of activation delay has investment value. Specifically, we find that sorting on expected activation delay (based on Eq.(1)) improves the profitability of a trading strategy that buys (sells) stocks with positive (negative) earnings news within 15 minutes of the announcement, giving more credence to the hypothesis that the market relies on TR.

[4]Investors value timely post-announcement analyst forecast and recommendation revisions (Stickel, 1989; Zhang, 2008; Yezegel, 2015), giving analysts strong incentives for quick information processing and dissemination (Cooper et al., 2001).

[5]Figure 6 provides examples of analyst reports that discuss TR's consensus surprise alongside analyst's own surprise.

and distribution of street earnings in capital markets, and makes explicit the role of forecast data providers in alleviating these frictions. Our framework offers new insights about the delay with which street earnings are constructed, disseminated, and subsequently impounded in market prices and analyst forecasts.

Empirically, we offer new evidence that is helpful in explaining the process by which street earnings are produced and revealed in capital markets. Specifically, we find that analysts and investors incorporate street earnings information with a delay, and that this delay is related to the delay with which TR disseminates I/B/E/S street earnings. Our study of the role of TR in processing street earnings complements and extends Akbas et al.'s (2018) study of the role of TR in processing analyst forecasts in several ways. First, processing earnings disclosures presents unique challenges, which we capture by including several measures of earnings and press release complexity. Second, earnings announcements are arguably the most important information events for valuation purposes in capital markets, giving TR strong incentives for quick processing. With average street earnings activation delay being approximately a third of forecast activation delay, Akbas et al.'s (2018) results may not extrapolate to our setting. Finally, we use novel identification strategies specific to our setting to establish a causal relation between street earnings activation delay and the delay with which investors and analysts respond to earnings news, critical to establishing the role of FDPs in the earnings information supply chain.

More broadly, our study also extends prior literature examining the role of various information intermediaries in the earnings disclosure process: equity analysts (Zhang, 2008), the press (e.g., Bushee et al., 2010), social media (e.g., Blankespoor et al., 2014), newswires (e.g., Boulland et al., 2017), and news alert services (e.g., Li et al., 2011). Our study focuses on an intermediary that performs a distinct task - the construction and the distribution of street earnings - on behalf of investors and other intermediaries.

2 Background and Institutional Setting

2.1 Street Earnings and the Role of FDPs in Prior Literature

Beginning with Ball and Brown (1968) and Beaver (1968), numerous studies document the value relevance of earnings, and recent evidence shows that the information content of earnings announcements has increased dramatically since 2001 (Beaver et al., 2017, 2018). To measure the news content of an earnings announcement, financial experts generally use the consensus error, calculated as the difference between realized earnings and the consensus analyst forecast (Chiang et al., 2018). While all public companies must report their earnings in accordance with Generally Accepted Accounting Principles (GAAP), the consensus error is typically calculated using non-GAAP "street" earnings. Street earnings may include or exclude transitory earnings components (e.g., discontinued operations, extraordinary items, nonrecurring items, restructuring costs, etc.), depending on how the majority of contributing analysts value the company.[6]

Managers, analysts, and FDPs have wide discretion in determining which earnings components to include/exclude in street earnings calculations. As a result, a number of prior studies have examined managers' and analysts' non-GAAP discretion and reporting incentives (e.g., Christensen et al., 2011; Barth et al., 2012; Doyle et al., 2013; Bentley et al., 2018). In addition, there is a large literature analyzing market reactions to GAAP and non-GAAP earnings surprises (e.g., Bradshaw and Sloan, 2002; Brown and Sivakumar, 2003; Bhattacharya et al., 2007). These studies generally find that investors respond more strongly to non-GAAP than to GAAP earnings.

Forecast data providers such as I/B/E/S construct and disseminate street earnings to the public. Although some prior studies acknowledge the role of FDPs in determining street earnings (Lambert, 2004; Abarbanell and Lehavy, 2007; Black et al., 2017), to our knowledge,

[6]Instances of voluntary management disclosures of non-GAAP earnings as well as analysts' adjustments of GAAP earnings have increased in recent years (Bentley et al., 2018).

the explicit role of FDPs in the earnings disclosure process remains largely unexamined.[7,8] Moreover, prior literature focuses on explaining the non-GAAP adjustments made to arrive at FDP-reported street earnings, assuming that all market participants determine street earnings instantaneously. In this study, we contribute to the existing non-GAAP literature by explicitly analyzing the role of FDPs in the street earnings reporting process.

2.2 Institutional Facts about FDPs' Role in Street Earnings Reporting

To shed light on the role of FDPs in processing and disseminating street earnings, our study examines the time it takes to construct street earnings from the earnings press release. We focus on a single representative FDP, TR's I/B/E/S database, as I/B/E/S is the most commonly used data source for both street earnings and analyst-based earnings surprise in prior literature.[9] TR obtains street earnings information by employing market specialists to monitor a variety of earnings reporting sources, including newswire feeds, press releases, company websites, and public filings. TR's methodology document states that market specialists review earnings reports to determine the amount that corresponds to the analyst majority basis at the time of reporting (Thomson Reuters, 2009). Christensen (2007) summarizes the process by which TR adjudicates between managers' non-GAAP earnings disclosures and analysts' consensus forecasts as follows:

> When the press release contains an adjusted earnings number, [TR checks] to see if it is the same as the number they plan to report as their "I/B/E/S actual" number based on forecasts. To the extent that (a) there is extreme disagreement

[7] Abarbanell and Lehavy (2007) refer to FDP street earnings numbers as a "black box" that cannot be traced back to a single manager or analyst produced data source, and Bradshaw and Soliman (2007, p. 736) state that there is "no compelling evidence in the literature that identifies FDP earnings as a predominantly analyst-driven, manager-driven, or forecast data provider-driven phenomenon."

[8] Schaub (2018) examines the dissemination of street earnings from 1995 to 2011 by a defunct FDP, First Call, and finds that day-late (next day or later) activations are associated with weaker announcement returns and stronger post earnings announcement drift (PEAD). However, the study does not discuss research questions related to the determinants of street earnings activation delay. In contrast, we study determinants and consequences of dissemination of street earnings by I/B/E/S from 2006 to 2015. Given that day-late activations account for only 2% of all activations after the 2009 change in I/B/E/S methodology, and that we find no evidence of PEAD in our sample, results of Schaub (2018) fall short of providing insights into the role of FDPs in today's markedly different environment.

[9] Thomson Reuters' marketing materials also claim that I/B/E/S data has "a 70:1 advantage of media citations, relied upon by over 70% of the top US and European asset managers."

> among analysts in what they were forecasting or (b) the earnings number adjusted for transitory items not forecasted by analysts disagrees with an adjusted number reported by managers in the press release, I/B/E/S delays reporting the I/B/E/S actual EPS number until it is able to go back and carefully examine the reason for the difference in adjustments. In these situations, it is possible for I/B/E/S to decide ex post whether or not to go along with what managers report in their press releases (Christensen, 2007, p. 744).

Consequently, TR market specialists devote significant resources processing companies' earnings press releases, and some releases take longer to process than others.

One major benefit of examining TR's I/B/E/S as a representative FDP is that we are able to observe the time it takes TR to process the street earnings actual. When the street earnings verification process ends, TR activates the actual by distributing it across client data platforms. Accordingly, we measure I/B/E/S street earnings activation delay (*Activation Delay*) as the time, in minutes, between the press release timestamp and the activation timestamp in I/B/E/S. Upon activation, I/B/E/S street earnings actuals are included in database calculations, such as earnings surprise metrics, and then disseminated via various TR product platforms.[10] Following Akbas et al. (2018), we view the activation time as a proxy for I/B/E/S dissemination time.

2.3 Research Questions

Our thesis is that information frictions prevent street earnings information from being instantaneously produced and impounded into stock prices, and that FDPs play a key role in alleviating these frictions. In this regard, our study extends prior research documenting delays in investors' response to earnings news due to their limited processing capacity or inattention (e.g., Hirshleifer et al., 2009; DellaVigna and Pollet, 2009; Frederickson and Zolotoy, 2016). Under this view, we conjecture that the time required by FDPs to construct the street earnings actual is a function of the temporary and recurring items included in

[10]Subscribers to some I/B/E/S products, such as I/B/E/S Real Time, receive data packets extremely close to the time of activation. Subscribers to other quantitative data products, such as I/B/E/S QFS, receive less timely periodic batch data updates throughout the day. I/B/E/S data are also disseminated through other Thomson Reuters platforms, such as Datastream and TR's flagship desktop product, Eikon, as well as through third-party providers such as Yahoo! Finance. In some cases, data updates for these downstream products occur less frequently, at daily, weekly, or monthly intervals.

GAAP earnings, as well as the manner in which these items are disclosed in earnings press releases.

Given that prior literature finds that street earnings are value relevant, we argue that market participants, such as investors and analysts, have an interest in obtaining street earnings information. As a result, the timeliness of their response to earnings news could vary with street earnings processing time. Further, if processing of street earnings is more efficiently performed by FDPs than other intermediaries or investors themselves, investors and analysts may rely directly on FDPs for street earnings information.

Figure 1 places the timing of FDPs' processing in the context of the overall earnings disclosure process observed in our sample. The mean (median) earnings press release in our sample is disseminated 33 (31) days after the end of the fiscal period. Companies file an 8-K containing the press release within 353 (34) minutes of newswire dissemination. Similarly, TR activates street earnings in I/B/E/S within 594 (44) minutes of press release dissemination. For companies providing conference calls, the mean (median) call occurs within 323 (121) minutes of press release dissemination, such that street earnings activation may occur either before or after the earnings conference call. Financial analysts then incorporate information from the current realization of quarterly street earnings and the conference call to revise their EPS forecasts within 1549 (1235) minutes, or about 26 (20) hrs, from press release dissemination. Overall, this descriptive evidence is consistent with FDPs potentially serving as important information intermediaries for other market participants.

3 What Determines Street Earnings Activation Delay?

3.1 Model Development

In this section, we introduce the determinants of TR's street earnings processing delay. In Sections 3.1.1 and 3.1.2, we argue that the time required by TR to construct the street earnings actual is a function of earnings and press release complexity. In Sections 3.1.3 and 3.1.4, we hypothesize that TR's processing delay varies with investors' demand for timely

information and TR's limited supply of attention and resources. Finally, in Section 3.1.5, we discuss the impact of TR's 2009 methodology change on its processing of reported earnings.

3.1.1 Earnings Processing Complexity

In order to adjust reported GAAP earnings to the same basis as analysts' forecasts, TR must determine relevant non-GAAP exclusions and their magnitudes. Accordingly, we conjecture that TR street earnings processing delay is increasing in the number of potential non-GAAP exclusions necessary to convert GAAP earnings to street earnings (*Potential Exclusions*), as well as the overall magnitude of the GAAP-to-street adjustments made by TR (*Abs(GAAP-Street Diff)*).

Earnings that deviate strongly from expectations are also more likely to require additional verification by TR specialists. Therefore, we predict that street earnings processing delay increases with the absolute value of the earnings surprise, *Abs(Surprise)*. In addition, as negative earnings surprises can have costly market consequences (Skinner and Sloan, 2002), we examine whether TR spends additional time verifying earnings of firms with negative surprises (*Bad News*). Moreover, prior literature finds that the timing of quarterly earnings announcements relative to firms' fiscal calendar ends, *Reporting Lag*, predicts the likelihood that announcements will contain negative news or complex items (e.g., Kross and Schroeder, 1984; Bagnoli et al., 2002; Johnson and So, 2017). If TR spends additional time on earnings press releases of late reporting firms, we expect a positive association between *Reporting Lag* and street earnings activation delay.

Fourth quarter results are more likely to contain special items (Burgstahler et al., 2002) and earnings revisions that are identified during external audits or year-end closing procedures (Kinney and McDaniel, 1989; Hollie et al., 2012; Haislip et al., 2017). As a result, street earnings activation delay may be longer for fourth quarter earnings (*QTR4*) relative to other quarters. Lastly, analysts' forecasting basis is more likely to conform with management's reporting basis for firms that provide earnings guidance (Doyle et al., 2013; Akbas et al., 2018). As such, we predict a negative association between *EPS Guidance* and

TR activation delay.

3.1.2 Press Release Complexity

The earnings press release is arguably one of the most important sources of information at the time of the earnings announcement. Prior literature documents that press releases include information about quarter-end earnings and its components (e.g., discontinued operations, extraordinary items, etc.) as well as management discussion of firm performance (Hoskin et al., 1986). Moreover, press releases have increased significantly in length and informativeness over time (Francis et al., 2002; Collins et al., 2009; Davis et al., 2012). Accordingly, we construct text-based measures of press release complexity that are likely associated with the processing time required to construct street earnings.[11]

When constructing street earnings, TR specialists use press releases to extract relevant pieces of information. If press release length increases the complexity of this task, we expect longer activation delays for firms with lengthier press releases. We use the number of words in the press release, (*Total Words*), to measure the length of the press release.

Bentley et al. (2018) use the text of earnings press releases to identify the presence of managers' non-GAAP EPS disclosures, and analyze the extent of managements' discussion of non-GAAP adjustments. From TR's perspective, more extensive non-GAAP discussion provided in the press release may reduce the complexity of identifying the categories and magnitudes of non-GAAP exclusions, resulting in shorter activation delay. Alternatively, more references to non-GAAP exclusions could be indicative of a longer list of exclusions and therefore more work for TR specialists. Thus, we explore the effect of management's non-GAAP discussion on street earnings activation delay by including *Non-GAAP Words*, constructed as in Bentley et al. (2018).

Text that contains numbers is more verifiable and precise than general descriptions of topics (Dyer et al., 2017). To the extent that narrative disclosure in earnings press releases

[11] TR's market specialists source street earnings actuals from newswire feeds, press releases, company websites, and public filings. We contend that the underlying press release content varies little, if at all, across dissemination channels. Therefore, to test predictions related to disclosure complexity, we use earnings press releases available on Form 8-K at the SEC's EDGAR system.

is supported by quantitative data, TR's task should be more straightforward. However, a larger mix of quantitative data relative to narrative disclosure (i.e., hard vs. soft information) could also point to the presence of a larger number of line items or non-GAAP exclusions that TR specialists have to examine. Accordingly, we also explore the effect of press release quantitative density by including *HardInfoMix*, the ratio of informative numbers to the total number of words in the press release (Dyer et al., 2017), as a determinant of street earnings activation delay.

Finally, we hypothesize that TR's processing delay may increase with the amount of operations- and strategy-related disclosures. These disclosures could be indicative of more complex underlying business operations that require more extensive non-GAAP adjustments to construct street earnings. To test this prediction, we include the number of operations- and strategy-related words (Dyer et al., 2017), *Operations*, as a determinant of street earnings activation delay.

3.1.3 Investor Demand for Timely Processing of Actual Earnings

TR caters to investors' demand for timely data processing (Akbas et al., 2018). Accordingly, we predict that street earnings activation delay decreases with investors' demand for timely street earnings information. Prior literature finds that investor demand for information is higher among firms with greater investor visibility (e.g., Frederickson and Zolotoy, 2016). Thus, we use multiple aspects of firm visibilty, including *Market Value*, *Advertising Expense*, *Media Coverage*, *Analyst Following*, *Institutional Ownership*, *Firm Age*, and *S&P 500* membership, as measures of investor demand. As these variables are highly correlated with each other and capture similar aspects of firm visibility, we employ principal component analysis to mitigate the multicollinearity problem. This procedure yields two factors with *Market Value*, *Advertising Expense*, and *Media Coverage* loading on one factor and *Analyst Following*, *Institutional Ownership*, *Firm Age* and *S&P 500* loading on the other. Since firms with higher market capitalization, advertising expense, and media coverage are more

visible to the general public, we label the first factor *General Visibility*. Analyst following, institutional ownership, firm age, and S&P 500 membership, however, likely capture firm visibility among institutional investors and, therefore, we label the second factor *Inst. Investor Visibility*.

3.1.4 Thomson Reuters' Limited Attention and Resources

Following Hirshleifer et al. (2009) and Akbas et al. (2018), we predict that FDPs are slower in processing earnings news when they face a larger backlog of unprocessed earnings announcements. We use the number of unactivated actuals (*Unactivated Actuals*) to measure TR's backlog around earnings announcements. Further, Berkman and Truong (2009) find that roughly 47% of the earnings announcements from January 2000 to December 2004 were made after hours, with the percentage of after-hours reporting increasing from 42% in 2000 to 49% in 2004. We observe a similar pattern in our data and predict that TR likely faces a large information load after the market closes (*After Market Close*), which should levy an additional toll on activation delay. Alternatively, given that firms often schedule the after-hours timing of their earnings announcements well in advance (Bagnoli et al., 2002), TR could shift its resources to times during which earnings announcements are more likely to occur. Finally, prior literature predicts that market participants are inattentive on Fridays (e.g., DellaVigna and Pollet, 2009; Michaely et al., 2016). Accordingly, we predict longer delays for *Friday* announcements.

3.1.5 I/B/E/S Methodology Change

In September 2009, TR changed its methodology for collecting and distributing street earnings actuals to provide increased data timeliness. Previously, when a company reported results, actuals of companies that reported *unexpected* charges or gains were temporarily "held out" from TR products to see if the majority basis would change going forward. This TR practice resulted in longer street earnings processing times. After September 2009, this "held out" period was completely eliminated and now TR reports all earnings actuals based

on the analysts' majority basis at the time of the earnings report, significantly increasing timeliness of actuals for companies with unexpected charges or gains (Thomson Reuters, 2009).[12]

Given these significant changes in TR's methodology for processing unexpected items, we predict that announcements containing an item that is likely to be classified as "unexpected" (*Unexpected Item*) will exhibit longer activation delays prior to September 30, 2009, and that this incremental delay will be reduced after the methodology change.[13] Accordingly, we include both *Unexpected Item* and its interaction with *Post*, an indicator equal to one for announcements after September 30, 2009, and zero otherwise. We expect to observe a positive coefficient on *Unexpected Item*, capturing incremental delays associated with the "held out" practice prior to the methodology change, and a negative coefficient on the interaction term capturing the decrease in activation delay associated with the methodology change.

3.2 Data

Table 1 describes our sample selection procedure. Our analyses require precise timestamps of earnings press releases. Therefore, our sample starts in 2006, the first year of Wall Street Horizon (WSH) timestamp data availability. We start with all quarterly street earnings actuals in I/B/E/S for firms whose stock is listed on NYSE, NYSE MKT, NASDAQ,

[12]Since September 2009, TR reviews analysts' reaction to unexpected line items *after* disseminating an initial actual based on the estimates majority basis at the time of the report. If analysts' go-forward majority basis changes after the fact, TR updates the actual and corresponding surprise values accordingly, and footnotes the reason. Activation timestamps are not revised and always reflect the initial data activation. While the 2009 methodology change improved the timeliness of initial street earnings activations, it likely lowered their reliability. To estimate changes in the reliability of actuals, we use TR's I/B/E/S "go-forward actuals" file (available starting in 2013) and find that reduced reliability of actuals is a relatively minor concern as only around 4% of announcements experience a go-forward basis change (untabulated).

[13]Our data do not identify which announcements contain line items deemed "unexpected" by TR specialists. Thus, we use the list of examples discussed in TR's methodology guide to identify line items likely to be classified as unexpected (see Thomson Reuters, 2009). Specifically, we define *Unexpected Item* as an indicator variable that equals one if a company reports any of the following eight unexpected charges/gains: a large restructuring charge, a large acquisition expense or gain, net credit or charge to reserves for bad debts from loan recoveries or charge-offs, nonrecurring income taxes, settlement of litigation or insurance, asset write-down, goodwill impairment, and large special items. An item is classified as large if it is in the top decile of the sample distribution of its absolute value.

or NYSE ARCA with a price greater than \$1 as of trading day $t-2$ relative to the I/B/E/S actual announcement date.

I/B/E/S provides two timestamps, the announcement time (ANNTIMS), which represents the time at which TR receives the relevant source data, and the activation time (ACTTIMS), which represents the time at which the estimate was activated in the I/B/E/S database. Bradley et al. (2014) find that I/B/E/S announcement timestamps are sometimes delayed from press release timestamps. Accordingly, to measure street earnings activation delay, we match each I/B/E/S actual with a corresponding press release timestamp from WSH, requiring the WSH press release date to be within five calendar days of the I/B/E/S announcement date. To further validate the WSH data, we require all observations to have an earnings press release available in Ravenpack for the same date as the WSH timestamp. In cases where intraday timestamps differ between the two data sources, we choose the earlier of the WSH and Ravenpack timestamps. For approximately 72.77% of earnings actuals in our sample, the I/B/E/S announcement timestamp is equal to the press release timestamp. For the remainder of observations in our sample, the I/B/E/S announcement timestamp is delayed by a mean (median) of 61.56 (26) minutes, indicating a delay in the time at which TR was able to obtain source data for some earnings reports.

We also require each observation in our sample to be matched to a Form 8-K from EDGAR containing the text of the earnings press release. Finally, we merge our sample with other databases required to collect variables in Eq.(1) (e.g., Compustat, CRSP). Appendix A.1 includes all variable definitions and data sources. Our main sample includes 67,908 quarterly earnings announcements made by 4,367 unique firms between January 2006 and December 2015. We delete observations with *Activation Delay* equal to zero or longer than 10 calendar days to control for likely I/B/E/S data errors (Bradley et al., 2014; Akbas et al., 2018). All other continuous variables are winsorized at the 1% level.

3.3 Descriptive Statistics

Table 2 reports summary statistics for variables in Eq. (1). The mean (median) *Activation Delay* is 594 (44) minutes and varies between 6 minutes at the 5th percentile and 4,288 minutes at the 95th percentile. An average firm has a market value of $4.56 billion, spends around $33 million a year on advertising, and is covered in an average of 51 news stories over the one month before its earnings announcement. Further, an average firm has an institutional ownership of 68.49% and is covered by 11 analysts.

The mean (median) *Potential Exclusions* is 2.65 (2), while the difference between GAAP and I/B/E/S earnings per share, captured by *Abs(GAAP-Street Diff)*, has a mean (median) of 59% (2%). Around 33% of announcements in the sample are *Bad News*, and around 11% have *EPS Guidance*. It takes on average 33 days to issue the press release after the fiscal period end.

Earnings press releases filed with the SEC have a mean (median) of 3,629 (2,859) words. In our sample around 89.2% (untabulated) of 8-K press releases contain non-GAAP trigger words, however, the ratio of non-GAAP words to total words in the press release is small, with a mean (median) of 0.68% (0.50%). An average press release contains 4.65% of quantitative data (*HardInfoMix*), while business operations and strategy disclosures (*Operations*) account for an average of 6.98% of total words. Further, the average number of announced but unactivated EPS actuals is 153, indicating TR's average workload at the time of the earnings announcement. *Unexpected Item* and *Post* have means of 0.37 and 0.64, respectively, indicating that 37% of announcements contain an item likely to be classified as "unexpected" and 64% of announcements in our sample occur after the 2009 methodology change.

Figure 2 illustrates the distributions of press release and street earnings activation times throughout the day. Similar to prior studies (e.g., deHaan et al., 2015; Michaely et al., 2016; Lyle et al., 2017), the majority of earnings press releases in our sample fall within two clusters: a pre-market cluster around 7–8AM and an after-market cluster at

4PM. While remaining bi-modal, the distribution of street earnings activation times is more widely dispersed, with the mass of pre-market activations trailing into regular trading hours, and the spike in activations after market close trailing later into the evening.

3.4 Multivariate Results

To test whether and how TR's street earnings activation delay is associated with various firm characteristics, we estimate the following panel regression:

$$\begin{aligned} Ln(Activation\ delay)_{i,t} = {} & \beta_1 \times Earnings\ Processing\ Complexity_{i,t} \\ & + \beta_2 \times Press\ Release\ Complexity_{i,t} \\ & + \beta_3 \times Demand\ for\ Timely\ Processing_{i,t} \\ & + \beta_4 \times Limited\ Attention\ /\ Resources_{i,t} \\ & + \beta_5 \times I/B/E/S\ Methodology\ Change_{i,t} + YearQtrFE + \epsilon_{i,t}, \end{aligned} \tag{1}$$

where *Ln(Activation delay)* is the natural logarithm of *Activation Delay* for firm i's earnings announcement on day t. *Earnings Processing Complexity*, *Press Release Complexity*, *Demand for Timely Processing*, *Limited Attention/Resources*, and *I/B/E/S Methodology Change* are vectors with predictor variables identified in Sections 3.1.1 - 3.1.5. *YearQtrFE* is a vector of year-quarter fixed effects.

Panel A of Table 3 reports the results of estimating Eq. (1). Column (1) reports the estimated coefficients, while Column (2) reports the marginal effects for each determinant category. We standardize all continuous variables to have a mean of zero and a standard deviation of one to facilitate interpretation. We find that all measures of earnings processing complexity, except *QTR4*, are statistically significant in the predicted directions. The coefficient on *Potential Exclusions* is 0.073 (t-stat=4.13), which implies that a one standard deviation increase in *Potential Exclusions* is associated with a 7.57% increase (45 minutes) in *Activation Delay*.[14] Further, a one standard deviation increase in *Abs(GAAP-Street Diff)* (coef. = 0.074, t-stat=6.75) is associated with an increase of around 46 minutes in *Activation Delay*. These results suggest that converting GAAP earnings to street earnings is a

[14]We calculate the marginal effects from our determinants model relative to the mean sample value of *Activation Delay*, which is equal to 594 minutes.

non-trivial task requiring a significant amount of FDP processing time. Other proxies for earnings processing complexity also have large effects on street earnings activation delay. Notably, when earnings news is negative, *Activation Delay* increases by an additional 75 minutes, while management EPS guidance reduces *Activation Delay* by 45 minutes. Overall, these results suggest that earnings processing complexity leads to substantial delays in street earnings processing.

Next, we find that press release disclosure complexity is incremental to the underlying earnings complexity in determining street earnings activation delay. In particular, the coefficient on *Ln(Total Words)* is 0.085 (t-stat=7.53), suggesting that a one standard deviation increase in *Ln(Total Words)* is associated with around 53 minutes increase in *Activation Delay*. *Non-GAAP Words* has a negative coefficient of -0.063 (t-stat=-4.05), consistent with non-GAAP disclosures reducing the time it takes TR to identify individual exclusions and their magnitudes. Finally, we find that lengthier discussions of firm operations and strategies increase the activation delay as evidenced by the large positive coefficient on *Operations* (coef. = 0.071, t-stat=5.75). Collectively, our results suggest that press release complexity has an economically meaningful impact on FDPs' street earnings processing time.

General Visibility and *Institutional Investor Visibility*, our two proxies for investors' demand for timely information, both have significantly negative coefficients, consistent with FDPs prioritizing more visible firms when processing earnings. Among proxies for FDP limited attention/resources, *Ln(Unactivated Actuals)* has a significantly positive coefficient, suggesting that an increase in the backlog of earnings announcements results in additional processing delay. In contrast to deHaan et al. (2015), who find evidence of lower media, analyst, and investor attention to earnings news released after hours, we find a highly significant negative coefficient on *After Market Close*, implying that, on average, announcements at 4:00 PM or after are processed by TR about 146 minutes faster than earnings announcements occurring earlier in the day. In untabulated tests, we find that this result is mainly driven by announcements occurring from 4:00PM-5:00PM. As 4:00PM-5:00PM is the most common

time for scheduled press releases in our sample, we interpret this result as TR rationally shifting resources to accommodate the predictable 4:00-5:00PM workload.

Finally, we find that, prior to the 2009 methodology change, *Unexpected Item* firms have on average 333 minutes longer *Activation Delay* than non-*Unexpected Item* firms, consistent with TR's "held out" period practice leading to significant incremental delays. However, the marginal effect of -393 minutes for *Post* × *Unexpected Item* suggests that this incremental delay is eliminated following TR's 2009 methodology change. Collectively, our results indicate that activating street earnings is a non-trivial process which varies with earnings and press release complexity as well as with investors' demand for information and FDPs' resources to process information.

3.5 FDP Queueing Behavior around Earnings Announcements

The results from Table 3, Panel A indicate that FDPs are slower in processing earnings news when there is a larger backlog of unprocessed earnings announcements. Frederickson and Zolotoy (2016) find that, when faced with the task of processing competing earnings announcements on the same day, investors queue announcements based on firm visibility. They indirectly infer investors' processing behavior from patterns in post-announcement market returns. In contrast, our research setting allows us to directly test FDPs' processing of competing earnings news. Specifically, we are able to observe both the FDP's queue of announced but yet-to-be-processed earnings (*Ln(Unactivated Actuals)*) and the speed with which the FDP processes a given announcement (*Activation Delay*). Further, while Frederickson and Zolotoy (2016) argue that their results are driven by less sophisticated investors, our results from estimating Eq. (1) are consistent with sophisticated information processors (i.e., FDPs) also having limited attention and earnings processing capabilities. Thus, visibility-based queuing in the presence of competing earnings announcements may be a general phenomenon pertaining to various market participants.

In Panel B of Table 3, we test whether the effect of *Ln(Unactivated Actuals)* on *Activa-*

tion Delay varies with firm visibility. We predict that the effect of *Ln(Unactivated Actuals)* on *Activation Delay* is weaker (stronger) for more (less) visible firms. Columns (1)-(3) of Table 3, Panel B, report the estimated coefficients from our analyses. As predicted, in Columns (1) and (2), we find significant negative coefficients for each individual interaction term. In Column (3) where both interaction terms are included, we find evidence of FDP queuing only based on *Inst. Investor Visibility* and not on *General Visibility*, consistent with FDPs catering to institutional investor demand for speedy processing. The coefficients of 0.207 on *Ln(Unactivated Actuals)* (t-stat=6.19) and -0.046 on *Ln(Unactivated Actuals)*×*Inst. Investor Visibility* (t-statistic -3.07) in Column (3) imply that a one standard deviation increase in *Ln(Unactivated Actuals)* increases activation delay by 171 (104) minutes for firms that are one standard deviation below (above) the mean level of *Inst. Investor Visibility*.

4 Do Investors Rely on I/B/E/S for Street Earnings Information?

Consistent with our proposed framework, the results in Section 3 indicate that FDPs face processing costs that delay street earnings activation. However, it is unclear whether this delay has consequences for the market reaction to earnings. On one hand, following a classic view in capital markets research, how earnings is disseminated to investors is irrelevant. Under this view, the market reaction to earnings is based solely on its information content and credibility (Merton, 1987). On the other hand, the costly processing framework predicts that information intermediaries, such as FDPs, reduce costs of identifying and processing relevant earnings information, leading to a more efficient price discovery process (e.g., Bloomfield, 2002). Therefore, our next step is to test whether street earnings activation delay has consequences for post-announcement price discovery.

To examine investors' reliance on TR for street earnings information, in Section 4.1, we employ a difference-in-differences research design based on the TR-specific methodology change to see if this change impacted the market reaction timeliness to earnings news. Next, in Section 4.2, we use short-window intraday tests to examine price discovery around TR

street earnings activations.

4.1 Street Earnings Activation Delay and Market Reaction Timeliness

4.1.1 Measuring Market Reaction Timeliness

Traditionally, in testing behavioral theories involving a delayed market reaction to news, researchers have sought to demonstrate that factors that cause delayed information processing are negatively related to the announcement-window earnings response coefficient (ERC) and positively related to the post-earnings announcement drift (PEAD) (e.g., Hirshleifer et al., 2009). However, in recent years, financial markets have become more efficient (Bai et al., 2016) and the post earnings announcement drift has largely disappeared (Chordia et al., 2014; Gregoire and Martineau, 2018). Therefore, it is highly unlikely it will take the market weeks or months to incorporate street earnings information into prices.[15] As a result, we investigate the relation between TR street earnings processing delay and the speed of the market reaction to earnings news over the first 5 days after the earnings announcement.

We follow prior literature (e.g., Butler et al., 2007; Bushman et al., 2010; Twedt, 2016; Lyle et al., 2017; Drake et al., 2017) and estimate the speed with which stock prices respond to earnings using market reaction timeliness (MRT, henceforth).[16] Specifically, we calculate the buy-and-hold abnormal return of each day over the [0, 5] trading window, scaled by the buy-and-hold abnormal return for the entire six-day window. Stated formally, MRT is defined as follows:

$$MRT[0,5] = \frac{\frac{1}{2}\sum_{t=1}^{5}(BHAR_{[0,t-1]} + BHAR_{[0,t]})}{BHAR_{[0,5]}} = \sum_{t=1}^{4}\frac{BHAR_{[0,t]}}{BHAR_{[0,5]}} + 0.5, \quad (2)$$

where $BHAR_{[0,t]}$ is the buy-and-hold abnormal return up to and including day t and $BHAR_{[0,5]}$ is the buy-and-hold abnormal return over the entire six-day period after the earnings an-

[15] Consistent with this, in untabulated tests, we find no evidence of PEAD in our sample of I/B/E/S-covered quarterly earnings announcements from 2006 to 2015. However, we do find untabulated evidence of a significant negative association between street earnings activation delay and short window ERC.

[16] Prior studies have labelled this measure as "intraperiod timeliness" (IPT) when examining either the timeliness of returns within a fiscal period or within an event post-announcement period. We use the label "market reaction timeliness" to clarify that we are examining a post-announcement period.

nouncement.[17]

Intuitively, holding the magnitude of the price response and information content fixed, MRT captures the timeliness with which earnings news is impounded into price. By construction, each point of MRT measures a daily return realization relative to the return for the entire [0,5] window, based on the assumption that street earnings information is fully incorporated in prices by trading day $t+5$ relative to the press release day t.[18] Price discovery is more (less) efficient, resulting in larger (smaller) values of MRT, if earlier days over the six-day period account for a larger (smaller) portion of $BHAR_{[0,5]}$.

Figure 3 plots the six-day MRT curves for firms in the highest and lowest activation delay deciles. We observe that around 70% of the six-day abnormal return, $BHAR_{[0,5]}$, is realized during the first two days for firms with the shortest activation delay, compared to around 59% return realization for firms with the longest activation delay. This graphical evidence suggests that longer activation delays result in a less efficient price discovery of earnings news.[19]

4.1.2 Testing Investors' Reliance

To test a causal link between TR activation delay and the speed of investors' processing of earnings, we examine MRT in the pre- and post-periods of TR-specific methodology change. In September 2009, TR increased its data timeliness by eliminating the "held out" period for companies with "unexpected" charges or gains.[20] Accordingly, using a difference-in-differences (DID) approach, we test whether TR's 2009 methodology change differentially impacted MRT for those firm-quarters likely affected by the elimination of the "held-out" pe-

[17] Following prior literature, we truncate the sample at $|BHAR_{[0,5]}| < 1\%$ to avoid small denominator problems.

[18] Some observations have MRT values greater than 100% of $BHAR_{[0,5]}$, indicating overreactions to earnings news. However, Figure 3 demonstrates that, on average, MRT increases monotonically towards 100% in our sample. We observe similar patterns for longer windows, e.g., $MRT_{[0,10]}$, however, differences in price efficiency in later days (days +6 to +10) are relatively small.

[19] We confirm our results in Figure 3 by regressing MRT on street earnings activation delay and control variables from Eq.(1). Results are not tabulated.

[20] Our results in Section 3.4 demonstrate that, *ceteris paribus*, firm-quarters reporting an *Unexpected Item* exhibited longer activation delays prior to this methodology change, but afterwards exhibit no incremental delay relative to other firm-quarters.

riod. Following TR's methodology guide (see Thomson Reuters (2009)), we identify treated firm-quarters as those that contain an *Unexpected Item*. Our control group consists of all other firm-quarters. If a significant portion of investors rely on TR to process street earnings information, we expect MRT to increase, particularly among treated firms, following the 2009 methodology change. Alternatively, if the association between street earnings activation delay and MRT is non-causal, i.e., TR simply incurs similar earnings processing costs as investors, we have no reason to expect an improvement in MRT in 2009 that differs for treated vs. untreated firms.[21]

To illustrate the differential shock to street earnings activation delay around the 2009 methodology change, Figure 4(a) plots the average street earnings activation delay for treated (control) earnings announcements that report (do not report) an *Unexpected Item*. We observe a significant drop in the activation delay, from around 2,800 minutes to less than 200 minutes, for announcements that report an *Unexpected Item*, while the drop in the activation delay for non-*Unexpected Item* firms is roughly half as large. Observing some decrease in activation delay for control firms suggests that our classification of firms into treated and control groups is imperfect. However, this imperfect assignment of firms into treated vs. control biases us against finding the predicted results.

To formally test the effect of the TR-specific methodology change on MRT, we estimate the following model:

$$\begin{aligned} MRT[0,5] = \alpha + \beta_1 \times Unexpected\ Item + \beta_2 Post + \\ \beta_3 Post \times Unexpected\ Item + B \times Controls + C \times FirmFE + \varepsilon. \end{aligned} \tag{3}$$

where *Unexpected Item* equals to one if a firm reports at least one unexpected charge or gain, and zero otherwise; *Post* is equal to one for announcements after September 30, 2009, and zero otherwise; *Controls* is a vector of covariates from Eq.(1) not related to the methodology

[21] Our conversations with TR representatives indicate that the 2009 methodology change was executed as part of the merger between the First Call and I/B/E/S databases. Thus, we believe the improvement in activation delay following the methodology change is TR-specific. We are not aware of any concurrent shocks in September 2009 that would cause investors to deferentially improve their processing of earnings news for firms reporting unexpected items vs. those that do not.

change. We include firm fixed effects to control for time-invariant firm characteristics of treated and control firms. In this model, *Post* × *Unexpected Item* captures the differential effect of the methodology change on MRT for firms that report unexpected charges/gains (treated) relative to those that do not report unexpected charges/gains (control).

Panel A of Table 4 reports the results of the difference-in-differences analysis in Eq. (3). We find a positive coefficient on *Post* × *Unexpected Item*, indicating that TR's methodology change to eliminate the "held-out" period for firms with unexpected items significantly increased the timeliness of market reactions to earnings for these firms. This result holds for the full sample of firms (coef. = 0.144, t-stat = 2.46) as well as for a subsample of firms in the highest and lowest activation delay deciles (coef. = 0.431, t-stat = 3.17). Figure 4(b) provides graphical evidence for the effect of the TR methodology change on MRT. While we observe an increase in MRT for non-*Unexpected Item* firms, the increase in MRT for *Unexpected Item* firms is almost twice as large. This corroborates our evidence in Panel B of Table 4 that TR's methodology change had a significant impact on MRT for firms that were subject to the methodology change. Panel B of Table 4 reports the results of placebo tests, where we randomly manipulate the treatment and control groups as well as the timing of the methodology change. In both placebo tests, *Post* × *Unexpected Item* is insignificant, suggesting that our documented results are specific to the TR methodology change.[22]

Overall, our findings of more timely market reactions to street earnings for firms with shorter TR activation delays as well as our findings of the impact of the TR methodology change on market reactions suggest that TR plays an important role in disseminating street earnings information to market participants.

4.2 Intraday Tests of Investors' Reliance

The results in Section 4.1 are consistent with investors relying on TR to process street earnings information. However, it is possible that the 2009 change in how TR processes earnings coincides with a change in how investors process earnings. Moreover, given the

[22]The notes to Table 4 provide a full description of the randomzation methods used for the placebo tests.

concentration and speed of events surrounding earnings announcements in recent years and considering TR's dramatic improvement in the timeliness of street earnings processing after 2009, using daily market reaction tests may be insufficient to draw robust inferences. To increase confidence in our conclusions, we conduct intraday price discovery tests in the post-2009 period.[23] Intraday tests allow us to examine very short windows around the exact time of street earnings activations in I/B/E/S. If TR facilitates the process by which the capital market discovers street earnings in the post-2009 period, then we should expect increased price discovery during the short window after street earnings are activated.

We use 15-minute intervals around earnings announcement and street earnings activation timestamps to estimate what portion of the two-day cumulative announcement return is concentrated around these events.[24] Stated formally, we estimate the following model:

$$RPD_t = \alpha_{FE} + \sum_{i=-16}^{-1} \beta_i Pre\_ANN_i + \sum_{i=1}^{16} \gamma_i Post\_ANN_i + \sum_{i=-16}^{-1} \delta_i Pre\_ACT_i + \sum_{i=1}^{16} \theta_i Post\_ACT_i + \varepsilon, \quad (4)$$

where the relative price discovery (RPD_t) for each 15-minute interval t over the two days window ([-960, +960] trading minutes) surrounding an earnings announcement is defined as $RPD_t = \frac{log(1+ret_{15\_trading\_min})}{log(1+ret_{[-960,+960]})}$, Pre_ANN_t equals one for the ith 15-minute pre-announcement interval, $Post\_ANN_i$ equals one for the ith 15-minute post-announcement interval, and Pre_ACT_i and $Post\_ACT_i$ are similarly defined for the pre- and post-activation intervals.[25] α_{FE} is a vector of fixed effects indicators. We include hourly time-of-day fixed effects in the regression to control for the fact that price discovery may be concentrated at certain times of day, such as the market opening hour.[26] We also include calendar year-quarter fixed effects, and require all firm-quarters to have [-960, +960] returns with an absolute value greater than

[23] Similar RPD tests appear in prior studies examining priority dissemination of earnings news (Dong et al., 2015), analysts' response to corporate news events (Li et al., 2015), and investors' response to I/B/E/S activations of analyst forecasts (Akbas et al., 2018).

[24] Our inferences remain unchanged if we estimate our tests over the full 2006–2015 sample period.

[25] We use TAQ data to examine trading during both regular and extended trading hours. As in Li et al. (2015) and Akbas et al. (2018), we examine 960-minute trading days (4:00AM to 8:00PM), and winsorize RPD_t at -1 and 1 to mitigate the effect of extreme observations.

[26] Hourly time-of-day fixed effects are indicator variables that take a value of one if the 15-minute interval begins within a given hour, and zero otherwise. For example, we include an indicator equal to one if the 15-minute interval begins between 8AM and 8:59AM, another indicator equal to one if the 15-minute interval begins between 9AM to 9:59AM, and so forth. Our results are stronger when these fixed effects are excluded.

1% to avoid small denominator problems (as in Section 4.1).

Our intraday research design has several unique features that facilitate identification. First, including $Post\_ANN_i$ and $Post\_ACT_i$ indicators helps isolate the incremental effect of street earnings activations on price discovery from the general post-earnings announcement drift phenomenon (Ball and Brown, 1968; Bernard and Thomas, 1989). We should only observe positive coefficients on the $Post\_ACT_i$ indicators if activations facilitate price discovery beyond what is generally observed during $Post\_ANN_i$ windows (Li et al., 2015).[27]

Second, examining 16 pre- and 16 post- intervals around both announcement and activation allows us to examine the extent of measurement error or information leakage in our press release and street earnings activation timestamps. If increased price discovery is concentrated immediately upon the earnings press release (street earnings activation), we expect a positive coefficient on the $Post\_ANN_1$ ($Post\_ACT_1$) indicator. If some investors receive privileged pre-announcement access to earnings news (Dong et al., 2015), we may also observe significant positive coefficients on the Pre_ANN_t indicators. Similarly, if some I/B/E/S customers receive privileged (delayed) data updates, we may observe significant positive coefficients on Pre_ACT_i indicators (in the case of privileged data updates) or on longer lagged $Post\_ACT_i$ indicators (in the case of delayed price discovery following activations).

Lastly, time of day is a strong determinant of intraday price discovery. Early intraday studies control for time of day effects using placebo announcements at the same time of day (e.g, Brown et al., 1992; Lee et al., 1993). More recent studies employing RPD tests partition their regression samples between regular, extended, and non-trading hours announcements (Li et al., 2015; Akbas et al., 2018). A unique feature of our research setting is that earnings press releases are clustered around two times of day (see Figure 2), a pre-market cluster between 7:00AM-7:59AM (20.04% of the RPD sample) and a post-market cluster between

[27] If the overlaps among included variables are substantial, multicollinearity could be a problem (Li et al., 2015). However, the largest variance inflation factor observed for any of the variables in our models is 1.32, suggesting that the statistical significance of our estimated coefficients is unlikely affected by this overlap.

4:00PM-4:59PM (46.27% of the RPD sample). Accordingly, to further facilitate identification and control for any variation in price discovery patterns due to announcement timing, we estimate our model separately on each of these clusters (referred to as the 7AM and 4PM samples, respectively). We also control for time-of-day effects by including hourly fixed effects in all models.

Table 5 presents the regression results for the full, 7AM, and 4PM samples of press releases. To facilitate exposition, we tabulate only coefficients for the 8 pre- and 8 post-indicators immediately before and after each event. In Column (1), the coefficient of 0.057 (t-stat=22.48) on $Post\_ANN_{+1}$ indicates that, on average, the first 15 minutes following an earnings announcement exhibit increased price discovery equivalent to 5.7% of the overall [-960,+960] trading minute return. Significant concentrations of price discovery continue over the next two hours following the earnings announcement.

Turning to street earnings activations, we find that the coefficient on $Post\_ACT_{+1}$ in Column (1) is 1.7% (t-stat=9.74). We also observe significantly positive coefficients for $Post\_ACT_{+2}$ through $Post\_ACT_{+8}$, indicating a period of sustained increases in price discovery for about two hours following street earnings activations. We observe similar results for our 7AM and 4PM press release subsamples. Further, we examine whether there is an increase in incremental price discovery from the one-hour period immediately preceding activations to the one-hour period immediately following activations. Consistent with this, the sum of the first four $Post\_ACT$ coefficients is significantly higher than the sum of the last four Pre_ACT coefficients by 3.0%, 5.5%, and 2.6% for the full sample, 7AM, and 4PM announcements, respectively.[28]

Figure 5 provides a visual summary of our RPD results for the full post-2009 sample, focusing on the hour before and after press release announcements and street earnings

[28]Interestingly, this result holds despite significant positive coefficients on Pre_ACT_{-1} in all samples. The positive coefficients on Pre_ACT_{-1} indicate increased price discovery in the 15-minute period prior to the I/B/E/S street earnings activation. This result suggest that some I/B/E/S customers receive privileged data dissemination prior to the activation. Alternatively, there is a measurement error in the activation timestamps provided in the I/B/E/S academic data.

activations. The blue (red) series plots the estimated coefficients around press release announcements (street earnings activations), with error bars indicating the 95% confidence intervals around each estimated coefficient. Visually, both earnings press releases and street earnings activations clearly exhibit significant post-event increases in intraday RPD, with the increases following the initial press releases naturally being larger in magnitude than those following street earnings activations.

Overall, the results of our intraday tests provide evidence of increases in price discovery during the hour following I/B/E/S activations, indicating that investors rely on TR to process street earnings information. It is possible, but highly unlikely, that investors not only determine street earnings independent of TR, but also intensify the price discovery at the exact time street earnings are incorporated in TRs data feeds. However, given that we find consistent evidence across our difference-in-difference tests in Section 4.1 and intraday tests in this section, it is improbable that our collective results are attributable to alternate explanations. Furthermore, in the Internet Appendix we demonstrate that our model of activation delay has intraday investment value during the post-2009 period, lending additional credence to the hypothesis that the market relies on TR.[29]

5 Do Analysts Rely on I/B/E/S for Street Earnings Information?

The results in Section 4 provide evidence that TR's processing of street earnings information affects investors' response to earnings news. A related question is whether TR's street earnings processing has implications for other capital market participants. Given that sell-side analysts have strong compensation-based incentives for quick information processing and dissemination (Cooper et al., 2001) and that investors value timely post-announcement analyst forecasts and recommendation revisions (Stickel, 1989; Zhang, 2008; Yezegel, 2015), in this section, we examine the relation between street earnings activation delay and sell-side

[29]Specifically, we find that sorting on expected activation delay (based on Eq.(1)) improves the profitability of a trading strategy that buys (sells) stocks with positive (negative) earnings news within 15 minutes of the announcement.

analysts' forecasting delay.[30]

In forming their forecasts, analysts reference the current street earnings surprise as it provides relevant performance information for the quarter just ended and helps evaluate future company prospects. While analysts surely calculate their own street earnings surprises independent of TR (or any other forecast data provider), they likely rely on TR to determine and disseminate street earnings consistent with the majority of analysts. Arguably, it is more efficient for one party (the FDP) to aggregate N individual forecasts, discover the majority basis, and adjust earnings for consistency with it, than for all N analysts to repeat this process independently. Moreover, to mitigate biases pertaining to individual forecasts, brokerage houses often require their analysts to discuss multiple earnings surprise metrics, not just the analyst's own surprise. Indeed, Figure 6 provides two examples of snippets from Morgan Stanley analyst reports that summarize both realized and expected EPS performance using both Morgan Stanley's own street earnings calculations as well as street earnings numbers provided by TR (highlighted in yellow).[31] Hence, if some analysts rely on TR for street earnings information, we expect that TR's activation delay of the current quarter earnings leads to delays in analysts' forecasts following the earnings announcement. To test this prediction, we estimate the following equation:

$$Ln(\overline{AnalystDelay}_{i,t}) = \alpha + \beta \times Ln(Activation\ Delay)_{i,t} + \theta \times \Gamma + YearQtrFE + \varepsilon_{i,t}, \quad (5)$$

where $\overline{AnalystDelay}_{i,t}$ is the time (in minutes) from when firm i announces quarter t earnings to when an analyst issues her next quarter EPS forecast, averaged across all analysts who issue their forecasts for firm i within the [0,5] day window. Γ is a vector of control variables that explain the time it takes an analyst to issue her forecast and includes variables from Eq. (1) as well as *Conference Call Lag* and *8K Filing Lag* to control for the arrival of new

[30] Clement et al. (2011) document that most analysts issue their forecasts shortly after an earnings announcement. In our sample, around 95% of observations have at least one analyst issuing next quarter's forecast during the first five days after the earnings announcement.

[31] In private conversations with a Morgan Stanley analyst, we confirmed that it is a common practice to use street earnings numbers reported by FDPs.

information and relevant analyst/broker characteristics.[32] We expect a positive coefficient on *Ln(Activation Delay)* (i.e., $\beta > 0$).

A positive coefficient on *Ln(Activation Delay)* in Eq.(5) may arise from either analysts relying on TR for street earnings information or analysts facing similar processing costs as TR. Given that prior to the 2009 methodology change TR waited on analysts to process unexpected items before determining whether to include or exclude these items from street earnings, we cannot use the difference-in-difference analysis based on TR's methodology change that we used in Section 4 to identify analysts' reliance on TR.[33] Instead, we employ an instrumental variables (IV) approach and focus on the post-2009 period where TR processes street earnings actuals strictly based on the pre-announcement consensus forecasting basis. Specifically, we use the number of firms in TR's activation queue (*Unactivated Actuals*) as an instrument to isolate the variation in activation delay that is exogenous to analysts' own processing and estimate a two-stage least squares (2SLS) system of equations, where the first stage specification is:

$$Ln(Activation\ Delay)_{i,t} = \alpha + \beta \times Ln(UnactivatedActuals)_{i,t} + \theta \times \Gamma + YearQtrFE + u_{i,t},$$

while Eq.(5) is the second stage specification.

This instrument is motivated by the idea that TR is tasked with processing earnings announcements for more than 3,000 firms, while an individual analyst covers, on average, 10 firms. Our key economic assumption is that, in processing a given firm's earnings announcement, concurrent announcements by other I/B/E/S firms distract TR specialists, while analysts are only distracted by the announcements of firms that they cover. Empirically, we find virtually no overlap between *Unactivated Actuals* and a given analysts' coverage

[32] Table 2 presents summary statistics on $\overline{Analyst\ Delay}$, and the additional analyst forecast delay controls. $\overline{Analyst\ Delay}$ has a mean (median) of 1,672 (1,291) minutes and varies between 573 minutes at the 5th percentile and 4,179 minutes at the 95th percentile. Descriptives for the added control variables are within their expected ranges.

[33] We observe (untabulated) that prior to the TR methodology change, analysts' post-earnings announcement forecasts are often announced prior to TR street earnings activation, especially for firms with unexpected items (around 37% of analysts announce prior to activation). In contrast, after the 2009 methodology change, only around 1% of analysts announce their forecasts prior to TR street earnings activation, regardless of the presence of unexpected items.

portfolio.[34] Thus, we assume that *Unactivated Actuals* are relevant to TR's activation delay, but exogenous with respect to analysts' forecast delay.

The relevance condition in our IV specification is that *Ln(Activation Delay)* varies with *Ln(Unactivated Actuals)*. The exclusion restriction is that the only channel through which TR's unactivated actuals affect analyst forecast delay is that of street earnings activation delay. Column (1) of Table 6 reports the results of the first stage of the instrumental variables approach. The positive and significant coefficient on *Ln(Unactivated Actuals)* indicates that our instrument satisfies the relevance condition - the higher the number of firms in TR's activation queue, the longer it takes TR to activate the earnings actual for a given firm. This relation is also confirmed by the under-identification χ^2-statistics, which strongly rejects the null of no relevance of the selected instrument. Further, the Kleibergen-Paap Wald F-statistic for weak instruments (Kleibergen and Paap, 2006) is 25.29, suggesting that weak instruments is not a problem in our setting.

Column (2) of Table 6 presents the results of the second stage of the instrumental variables approach. Using *Ln(Unactivated Actuals)* as an instrument for *Ln(Activation Delay)* in Eq.(5), we find that a one standard deviation increase in instrumented street earnings activation delay leads to an approximate 19.5% increase in analysts' forecasting delay.[35] Relative to the sample mean, this translates to an incremental average forecasting delay of approximately 5.4 hours. For completeness, in Column (3), we also report the coefficient estimates from an Ordinary Least Squares (OLS) regression. Consistent with our IV estimates, we find that a one standard deviation increase in *Ln(Activation Delay)* is associated with an approximately 4.2% longer analyst forecast delay. Overall, the results reported in Table 6 provide evidence consistent with financial analysts relying on TR's street earnings actuals when updating their post-announcement earnings forecasts.

[34] In untabulated tests, we find that the mean (median) overlap between firms in TR's queue and firms in firm i's analysts' portfolio is 1 (0). In addition, analysts may also be distracted by announcements of firms in the industries they follow. We obtain similar (untabulated) results if we calculate *Unactivated Actuals* as the difference between all firms in TR's queue and firms in TR's queue that are in the same Fama-French 48 industry portfolio as a given firm i.

[35] We find similar results (untabulated) if we include firm fixed effects in the specification of Eq.(5).

6 Conclusion

Our study offers new insights into how earnings information is incorporated in capital markets. We introduce a simple framework that emphasizes the role of information frictions in the production and distribution of street earnings in capital markets, and makes explicit the role of forecast data providers in alleviating these frictions. Consistent with predictions derived from this framework, we present novel evidence about the delay with which street earnings are constructed, disseminated, and impounded in market prices. Specifically, we find that significant variation in FDP street earnings activation delay is explained by earnings and press release complexity, as well as the supply of and demand for FDPs' attention. In cross-sectional tests, we also find that, when faced with competing earnings announcements, FDPs prioritize their information processing backlog according to firm visibility. Further, we present evidence that equity analysts and investors incorporate street earnings information in earnings forecasts and prices with a delay, and that this delay is partially driven by the delay with which TR disseminates I/B/E/S street earnings.

Thomson Reuters is one of several FDPs that adjust GAAP earnings for consistency with their own proprietary consensus forecasts,[36] which raises the question of generalizability of our evidence. Lacking data on other FDPs, we offer several observations. First, we expect our results on the determinants of activation delay to hold in the main. Our analysis incorporates general as well as setting-specific determinants of information processing in capital markets, which likely apply to other data providers. Second, other FDPs are likely to differ from TR in their construction and dissemination of street earnings to the extent that their clients differ in sophistication and demand for timely information. Finally, whether other FDPs contribute more or less to price efficiency likely depends on how well their versions of street earnings approximate "true" operating earnings, as well as speed and breadth of dissemination. We leave it to future research to collect data on other FDPs and paint a more complete picture of the supply of street earnings to the market.

[36] Prominent TR competitors include Capital IQ, FactSet, Bloomberg, and Zacks.

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Appendix

Table A.1: Variable Definitions and Data Sources.

Variable	Definition
Earnings Processing Complexity	
Activation Delay	Time (in minutes) from the press release time until activation time (Source: I/B/E/S, WSH, RavenPack).
Potential Exclusions	The total number of times any of the following fourteen charges have been reported in a given quarter: restructuring charge, acquisition expense or gain, net credit or charge to reserves for bad debts from loan recoveries or charge-offs, nonrecurring income taxes, settlement of litigation or insurance, asset write-down, goodwill impairment, special items, currency translation adjustment, gain or loss from investments, gain or loss from the sale of property, stock compensation, extraordinary items and discontinued operations, and accounting change (Source: Compustat).
Abs(GAAP-Street Diff)	The absolute value of the difference between Compustat earnings before extraordinary items per share and I/B/E/S earnings per share, scaled by the absolute value of I/B/E/S earnings (Source:I/B/E/S, Compustat)
Surprise	Actual earnings per share minus the median analyst earnings per share forecast over the last 90 days deflated by the absolute value of the median forecast (Source: I/B/E/S, CRSP).
Abs(Surprise)	The absolute value of *Surprise* (Source: I/B/E/S, CRSP).
Bad News	A dummy variable that equals one if *Surprise* is negative and zero otherwise (Source: I/B/E/S, CRSP).
Reporting Lag	Number of days between the fiscal year and and the earnings announcement day (Source: I/B/E/S, Compustat, RavenPack, WSH).
QTR4	A dummy variable that equals 1 if the firm is announcing its 4th fiscal quarter earnings and zero otherwise (Source: Compustat).
EPS Guidance	A dummy variable that equals 1 if the firm has issued an earnings guidance during the current fiscal quarter (Source: I/B/E/S).
Press Release Complexity	
Total Words	Total number of words in the earnings press release (Source: SEC EDGAR).
Non-GAAP Words	The number of non-GAAP trigger words or phrases contained in the press release (e.g., any variation of words such as "adjust", "exclude", "proforma", "non-GAAP", "remove", "without", "except for", etc.) scaled by the total number of words in the press release (Source: SEC EDGAR).
HardInfoMix	The number of informative numbers (e.g., numbers that are not associated with dates or headings) in the press release relative to the total number of words (Source: SEC EDGAR).

Table A.1, continued

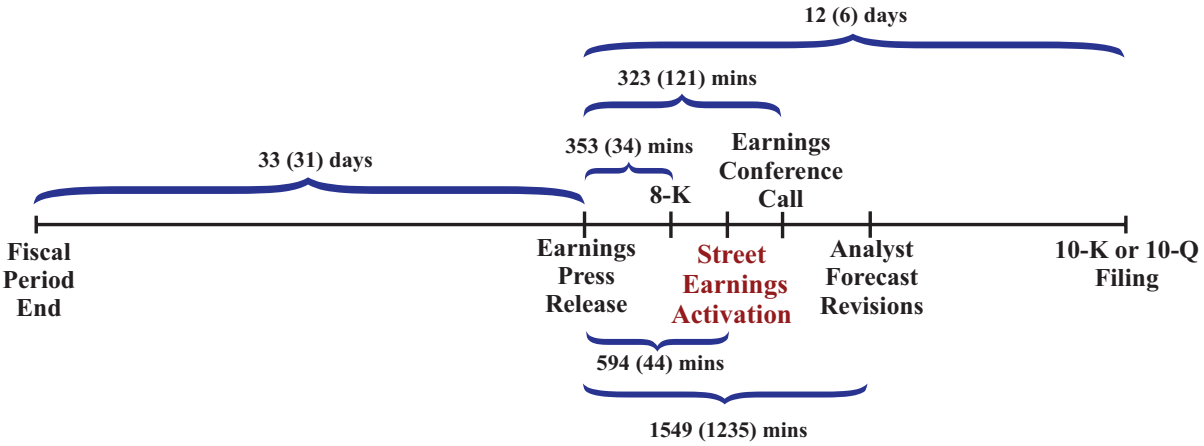
Variable	Definition
Operations	The total number of words in the earnings press release related to day-to-day company operations or strategy (e.g., products, advertising, accounts receivable, contractors) scaled by the total number of words in the press release (Source: SEC EDGAR).
Demand for Timely Processing	
Market value	Market value of the firm as of the most recent fiscal quarter end before the earnings announcement day (Source: Compustat).
Advertising Expense	Total advertising expense as of the most recent fiscal year end before the earnings announcement day (Source: Compustat).
Media Coverage	Number of news stories published on the firm over the one month before the earnings announcement (Source: RavenPack).
General Visibility (Factor)	Principal factor based on *Market value*, *Advertising Expense*, and *Media Coverage*.
Analyst Following	Number of analysts covering the firm over the one-year period ending on the most recent month end before an earnings announcement (Source: I/B/E/S).
Institutional Ownership	The percentage of shares held by 13F institutions as of the end of the most recent calendar quarter before the earnings announcement (Source: Thomson Reuters CDA/Spectrum Institutional Holdings s34).
Firm Age	Number of years since the firm's initial public offering data (Source: CRSP, Compustat).
S&P 500	A dummy variable that equals 1 if the firm is in the S&P 500 index on the day of the earnings announcement and zero otherwise (Source: Standard and Poor's).
Inst. Investor Visibility (Factor)	Principal factor based on *Analyst Following*, *Institutional Ownership*, *Firm Age* , and *S&P 500*.
Limited Attention/Resources	
Unactivated Actuals	The number of all unactivated (as of the earnings announcement minute) earnings announcements by other firms over the [-5, 0] calendar day window, where day 0 is the earnings announcement day (Source: I/B/E/S).
After Market Close	A dummy variable that equals one of earnings is announced after market closes and zero otherwise (Source: I/B/E/S, Compustat, RavenPack, WSH).
Friday	A dummy variable that equals one if the announcement day is Friday and zero otherwise (Source: I/B/E/S).

Table A.1, continued

Variable	Definition
IBES Methodology Change	
Post	A dummy variable that equals one for observations in the post 2009 Q3 period and zero otherwise.
Unexpected Item	A dummy variable that equals one if a company reports any of the following eight unexpected charges/gains in a quarter: a large restructuring charge, a large acquisition expense or gain, net credit or charge to reserves for bad debts from loan recoveries or charge-offs, nonrecurring income taxes, settlement of litigation or insurance, asset write-down, goodwill impairment, and large special items. An item is classified as large if it is in the top decile of the sample distribution of its absolute value (Source: Compustat).
Outcome Variables	
MRT[0,5]	Six-day market reaction timeliness measure, calculated as $\frac{\frac{1}{2}\sum_{t=1}^{5}(BHAR_{[0,t-1]}+BHAR_{[0,t]})}{BHAR_{[0,5]}} = \sum_{t=1}^{4}\frac{BHAR_{[0,t]}}{BHAR_{[0,5]}} + 0.5$, where $BHAR_{[0,t]}$ is the buy-and-hold abnormal return up to and including day t and $BHAR_{[0,5]}$ is the buy-and-hold abnormal return over the entire six-day period after the earnings announcement (Source: CRSP).
RPD	Relative price discovery for each 15-minute interval t over the two-day window ([-960, +960] trading minutes) surrounding an earnings announcement, calculated as $RPD = \frac{log(1+ret_{15\_trading\_min})}{log(1+ret_{[-960,+960]})}$ (Source: TAQ).
Other	
Firm Specific Experience	Number of years the analyst has been issuing earnings forecasts on the firm (Source: I/B/E/S).
Broker Size	The number of analysts employed by the broker covering the firm as of the firm's earnings announcement (Source: I/B/E/S).
Conference Call	A dummy variable that equals one if the firm has hosted an earnings conference call within five days after the earnings announcement and zero otherwise (Source: WSH).
Conference Call Lag	The time (in minutes) between the earnings announcement time and the conference call time (Source: I/B/E/S, Compustat, RavenPack, WSH).
8K Filing Lag	The time (in minutes) between the earnings announcement time and the 8-K filing time (Source: I/B/E/S, Compustat, RavenPack, WSH).
Earnings Announcements	Number of earnings announcements made during the [-5,0] window relative to a firm's earnings announcement, where day 0 is the firm's earnings announcement day (Source: I/B/E/S).

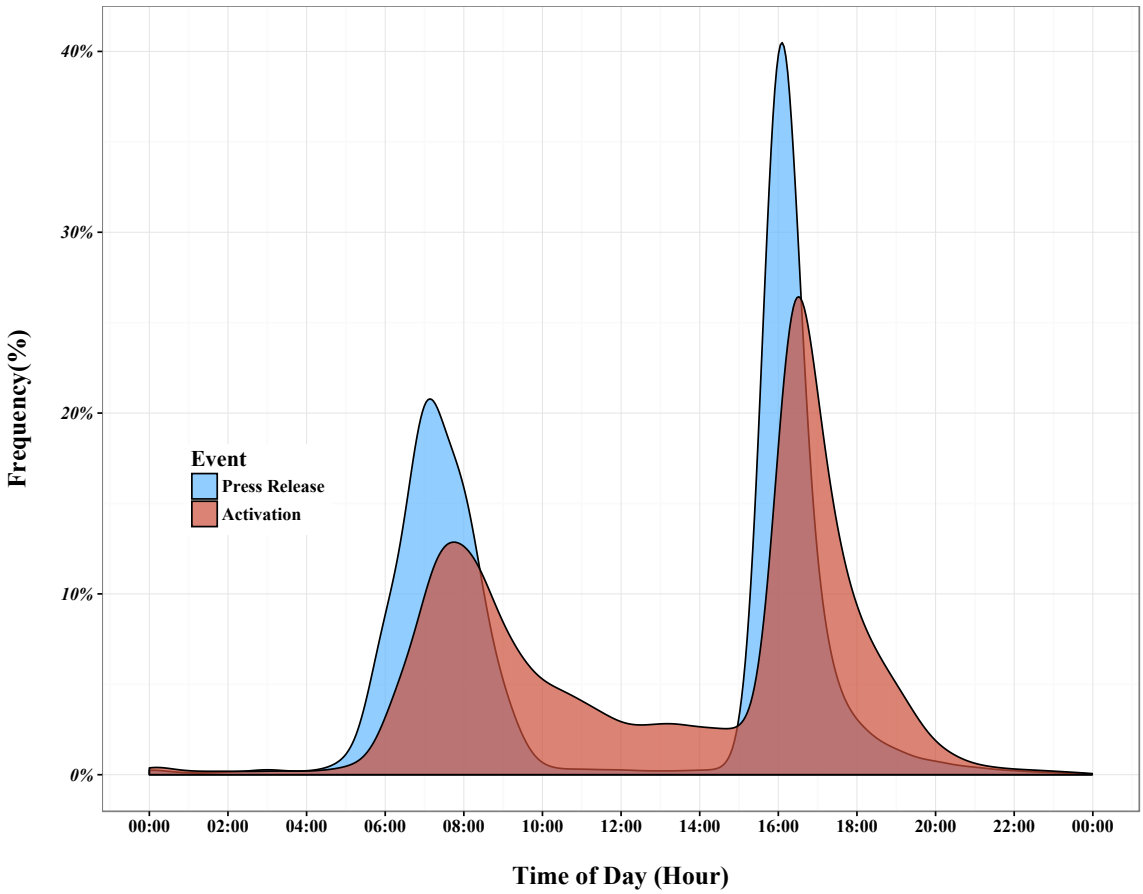
Tables and Figures

Figure 1: Earnings Reporting and Processing Timeline.



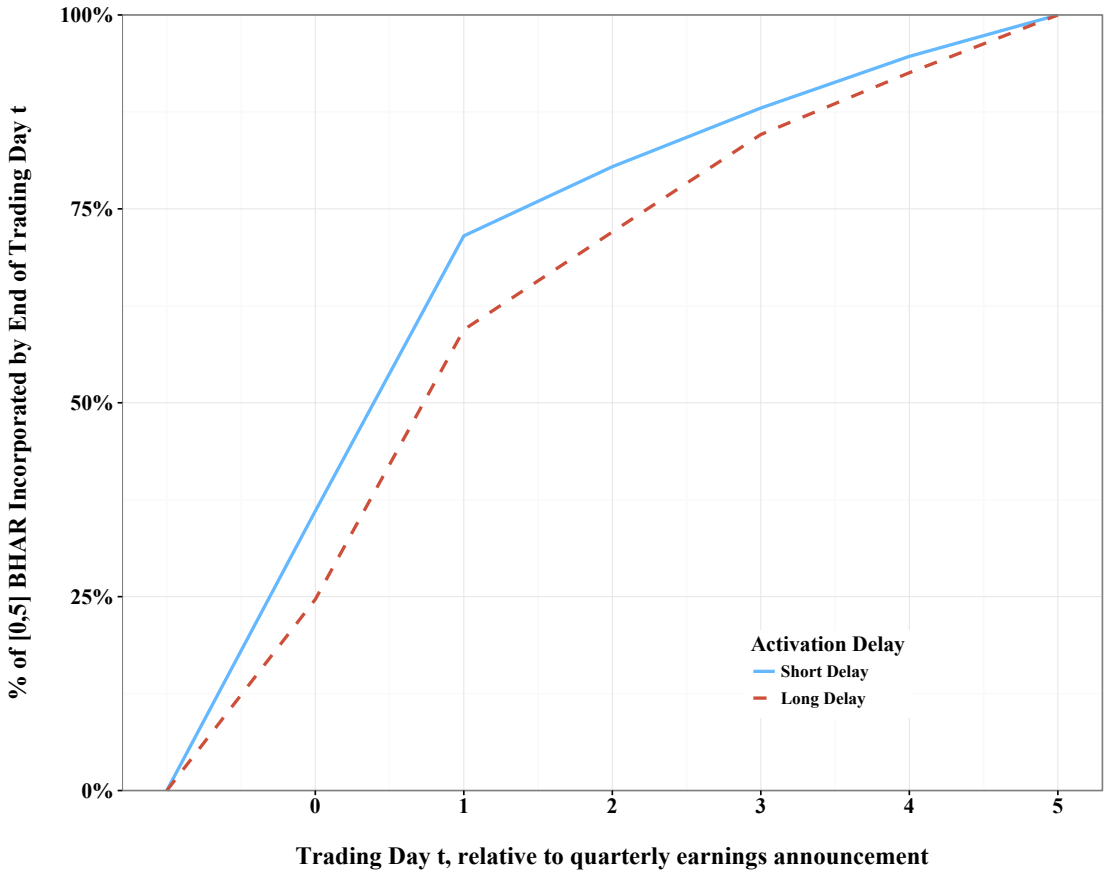
This figure shows the timeline of the quarterly earnings disclosure process staring at the fiscal period end and ending at the filing date of the quarterly (10-Q) or annual (10-K) report. The mean (median) time distances between relevant events for our sample of quarterly earnings announcements are reported along curly brackets.

Figure 2: Distributions of Press Release and Street Earnings Activation Times, by hour of day.



This figure plots the frequency (%) of observations in our sample with event timestamps occurring during a given hour of the day. The blue density curve plots the frequency of press release announcements and the red density curve plots the frequency of I/B/E/S street earnings data activations.

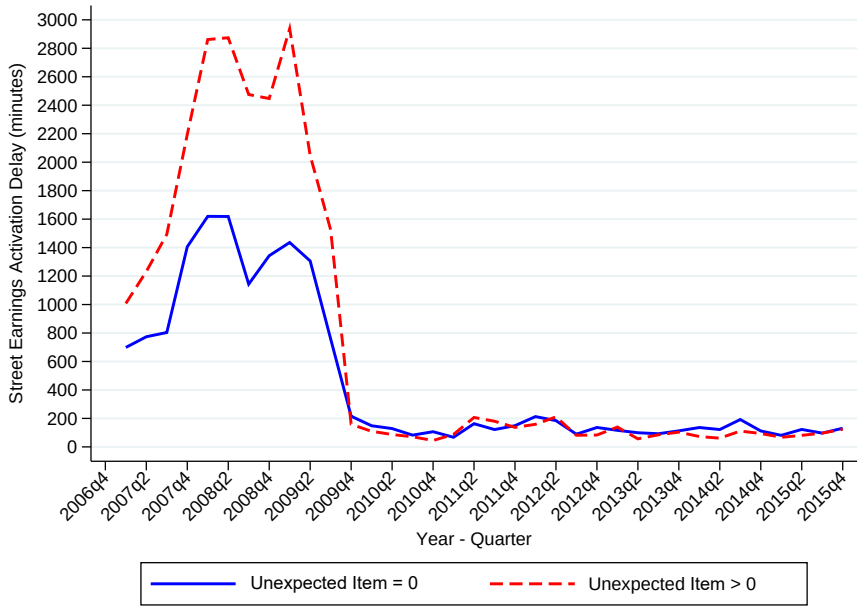
Figure 3: Intraperiod Market Reaction Timeliness Curves for Firms in the Shortest and Longest Activation Delay Deciles



This figure plots daily averages of market reaction timeliness (MRT) of earnings for firms in the shortest and longest activation delay deciles over the six-day period after the earnings announcement. The activation delay deciles are created using quarterly sorts of earnings announcements of *Activation Delay*. Day 0 is the day of the earnings announcement. MRT[0,t] is equal to the cumulative buy-and-hold return from day 0 to day t, divided by the cumulative abnormal return for the entire six-day window.

Figure 4: Activation Delay and Market Reaction Timeliness of Earnings in the Pre- and Post- Periods of IBES Methodology Change.

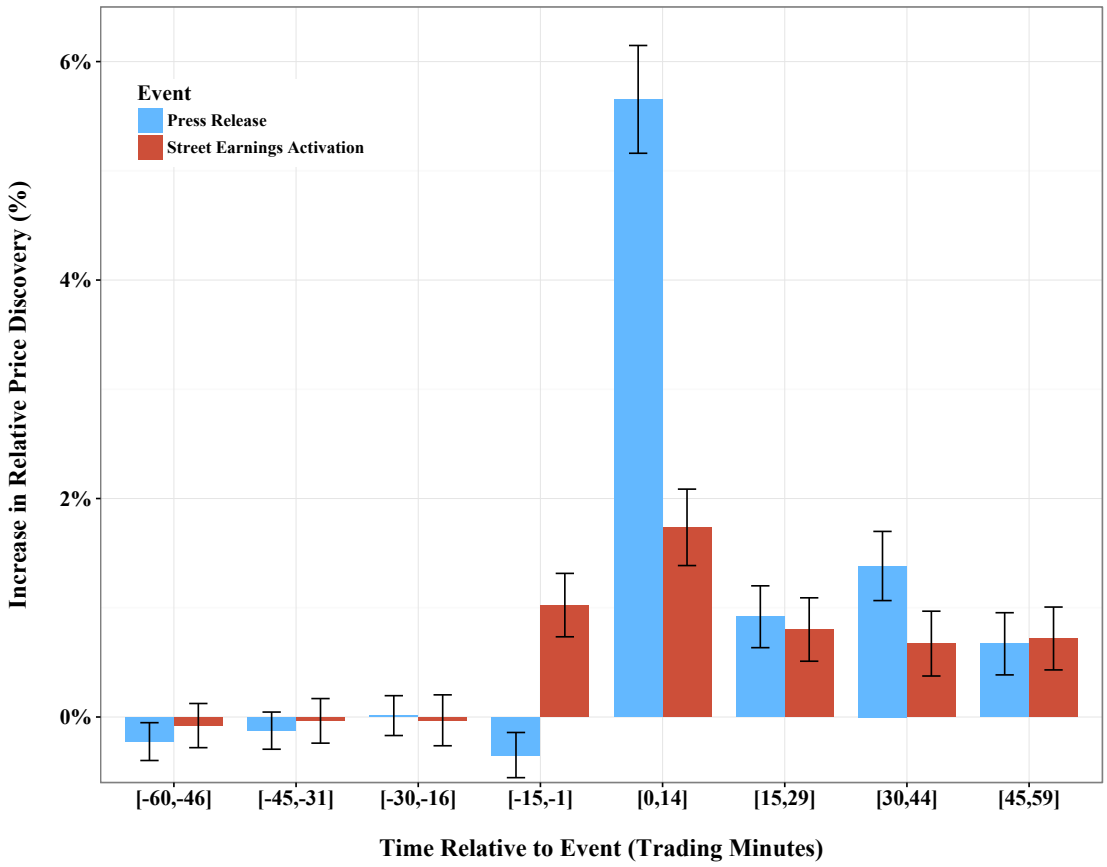
(a)



(b)

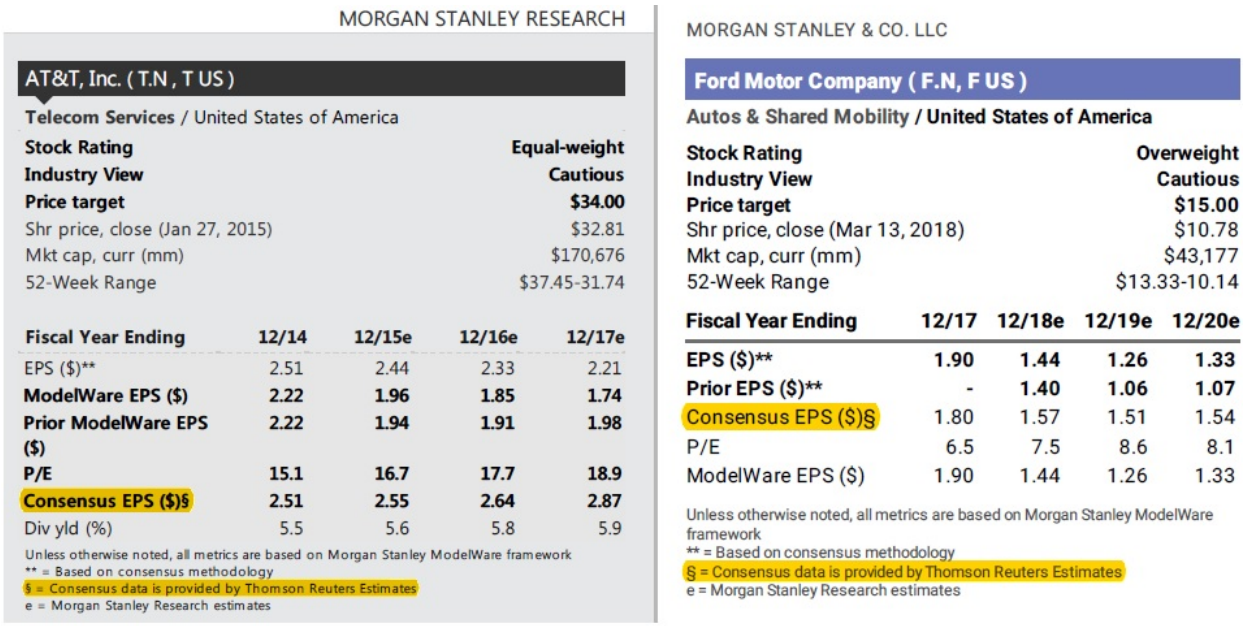
This figure plots the average street earnings activation delay (part (a)) and market reaction timeliness (*MRT[0,5]*) of earnings (part (b)) over the period 2006-2015 for *Unexpected Item* firms (treated group) and non-*Unexpected Item* firms (control group). Part (b) plots one-year moving averages of *MRT[0,5]*.

Figure 5: Intraday Price Discovery Increases around Quarterly Earnings Press Releases and Street Earnings Activations



This figure plots the estimated coefficients from Model 4. Error bars note the 95% confidence intervals around each coefficient estimate.

Figure 6: Examples of Analyst Reports Citing Thomson Reuters Street Earnings



MORGAN STANLEY RESEARCH

AT&T, Inc. (T.N , T US)

Telecom Services / United States of America

Stock Rating	**Equal-weight**
Industry View	**Cautious**
Price target	**$34.00**
Shr price, close (Jan 27, 2015)	$32.81
Mkt cap, curr (mm)	$170,676
52-Week Range	$37.45-31.74

Fiscal Year Ending	**12/14**	**12/15e**	**12/16e**	**12/17e**
EPS ($)**	2.51	2.44	2.33	2.21
ModelWare EPS ($)	**2.22**	**1.96**	**1.85**	**1.74**
Prior ModelWare EPS ($)	**2.22**	**1.94**	**1.91**	**1.98**
P/E	**15.1**	**16.7**	**17.7**	**18.9**
Consensus EPS ($)§	**2.51**	**2.55**	**2.64**	**2.87**
Div yld (%)	5.5	5.6	5.8	5.9

Unless otherwise noted, all metrics are based on Morgan Stanley ModelWare framework
** = Based on consensus methodology
§ = Consensus data is provided by Thomson Reuters Estimates
e = Morgan Stanley Research estimates

MORGAN STANLEY & CO. LLC

Ford Motor Company (F.N, F US)

Autos & Shared Mobility / United States of America

Stock Rating	**Overweight**
Industry View	**Cautious**
Price target	**$15.00**
Shr price, close (Mar 13, 2018)	$10.78
Mkt cap, curr (mm)	$43,177
52-Week Range	$13.33-10.14

Fiscal Year Ending	**12/17**	**12/18e**	**12/19e**	**12/20e**
EPS ($)**	**1.90**	**1.44**	**1.26**	**1.33**
Prior EPS ($)**	**-**	**1.40**	**1.06**	**1.07**
Consensus EPS ($)§	1.80	1.57	1.51	1.54
P/E	6.5	7.5	8.6	8.1
ModelWare EPS ($)	1.90	1.44	1.26	1.33

Unless otherwise noted, all metrics are based on Morgan Stanley ModelWare framework
** = Based on consensus methodology
§ = Consensus data is provided by Thomson Reuters Estimates
e = Morgan Stanley Research estimates

This figure shows snippets of Morgan Stanley analyst reports for AT&T (left side) and Ford Motor (right side) companies, published on January 28, 2015 and March 14, 2018, respectively.

Table 1: Sample Selection.

	Observations
Firm-quarters with earnings announcement dates from 2006 to 2015 with valid quarterly unadjusted EPS actual and activation delay data available on I/B/E/S	194,728
After requiring common stocks on NYSE, NYSE MKT, NASDAQ, or NYSE ARCA with stock price greater than $1	136,393
After requiring earnings announcement timestamp data from Wall Street Horizon	127,867
With valid timestamp on the same date from Ravenpack	86,702
With 8-K data available from EDGAR	71,408
Less: firm-quarters missing data to compute the variables defined in Appendix A.1	(3,500)
Full Sample	67,908
Sample for [0,5] day market reaction timeliness tests	59,257
(Full Sample less firm-quarters with [0,5] announcement-window abnormal returns with absolute value less than 1%)	
Sample for intraday price discovery tests	36,347
(Full Sample firm-quarters with earnings announcement dates between October 1, 2009 and December 31, 2015 with available data from TAQ, less observations with [-960,960] trading minute announcement-window returns with absolute value less than 1%)	

This table describes the sample selection procedure used to collect the data analyzed in our study.

Table 2: Descriptive Statistics.

Variable	Mean	Std Dev	5^{th} Pctl	Median	95^{th} Pctl
Activation Delay	594	1,742	6	44	4,288
Earnings Processing Complexity					
Abs(GAAP-Street Diff)	0.59	1.96	0.00	0.02	2.68
Potential Exclusions	2.65	1.43	1.00	2.00	5.00
Surprise	−0.01	1.23	−1.16	0.04	1.11
Abs(Surprise)	0.57	1.49	0.00	0.14	2.50
Bad News	0.33	0.47	0.00	0.00	1.00
EPS Guidance	0.11	0.32	0.00	0.00	1.00
QTR4	0.24	0.43	0.00	0.00	1.00
Reporting Lag	33	12	18	31	57
Press Release Complexity					
Total Words	3,629	4,079	1,427	2,859	7,724
Non-GAAP Words (%)	0.68	0.66	0.00	0.50	1.92
HardInfoMix (%)	4.65	4.34	0.81	3.22	12.78
Operations (%)	6.98	2.12	3.57	6.99	10.50
Demand for Timely Processing					
General Visibility (Factor)	0.00	0.87	−0.43	−0.30	1.39
Market Value ($millions)	4,564	11,920	78	925	20,894
Advertising Expense($millions)	33	136	0	0	152
Media Coverage	51	397	0	15	141
Inst. Investor Visibility (Factor)	0.00	0.84	−0.92	−0.24	1.85
Analyst Following	11	9	2	9	30
Institutional Ownership	68.49	25.61	17.47	74.74	100.00
Firm Age	19.27	17.11	1.38	14.73	51.26
S&P 500	0.17	0.37	0.00	0.00	1.00
Limited Attention/Resources					
Unactivated Actuals	153	108	26	134	340
After Market Close	0.53	0.50	0.00	1.00	1.00
Friday	0.055	0.228	0.000	0.000	1.000
IBES Methodology Change					
Unexpected Item	0.37	0.48	0.00	0.00	1.00
Post	0.64	0.48	0.00	1.00	1.00
Other					
Analyst Delay (minutes)	1,672	1,179	573	1,291	4,179
Firm Specific Experience	3.23	2.14	0.68	2.81	7.09
Broker Size	49	26	16	42	100
Conference Call	0.91	0.28	0.00	1.00	1.00
Conference Call Lag (minutes)	322	387	29	129	1,100
8K Filing Lag (minutes)	336	966	0	32	1,615
Earnings Announcements	321	154	69	316	576

This table presents summary statistics for street earnings activation delay and its determinants. The sample includes 67,908 quarterly earnings announcements made by 4,367 unique NYSE- and Nasdaq-listed firms between January 2006 and December 2015. Variable definitions are reported in Appendix A.1.

Table 3: Analysis of Street Earnings Activation Delay.

Panel A: Determinants of Street Earnings Activation Delay			
	Exp. Sign	Coef. Est.	Marg. Effect
Earnings Processing Complexity			
Potential Exclusions	+	0.073***	45.00
		(4.13)	
Abs(GAAP-Street Diff)	+	0.074***	45.64
		(6.75)	
Abs(Surprise)	+	0.081***	50.13
		(5.55)	
Bad News	+	0.119***	75.09
		(5.66)	
EPS Guidance	-	−0.079***	−45.13
		(−3.17)	
QTR4	+	0.015	
		(0.47)	
Reporting Lag	+	0.077***	47.56
		(3.67)	
Press Release Complexity			
Ln(Total Words)	+	0.085***	52.71
		(7.53)	
Non-GAAP Words	?	−0.063***	−36.28
		(−4.05)	
HardInfoMix	+	0.005	
		(0.51)	
Operations	+	0.071***	43.72
		(5.75)	
Demand for Timely Processing			
General Visibility	-	−0.074***	−42.38
		(−3.54)	
Inst. Investor Visibility	-	−0.078***	−44.58
		(−4.08)	
Limited Attention/Resources			
Ln(Unactivated Actuals)	+	0.205***	135.19
		(6.13)	
After Market Close	?	−0.282***	−146.01
		(−6.80)	
Friday	-	−0.053	
		(−1.07)	
I/B/E/S Methodology Change			
Unexpected Item	+	0.445***	333.03
		(6.68)	
Post × Unexpected Item	-	−0.553***	−393.86
		(−8.63)	
Year-Quarter FE		Yes	
Observations		67,908	
Adj. R^2		0.502	

This panel reports coefficient estimates from the following panel regression:

$$\begin{aligned} \textit{Ln(Activation Delay)} = {} & \beta_1 \times \textit{Earnings Processing Complexity} + \beta_2 \times \textit{Press Release Complexity} \\ & + \beta_3 \times \textit{Demand for Timely Processing} + \beta_4 \times \textit{Limited Attention/Resources} \\ & + \beta_5 \times \textit{I/B/E/S Methodology Change} + YearQtrFE + \varepsilon. \end{aligned}$$

Variable definitions are provided in Appendix A.1. The sample includes 67,908 quarterly earnings announcements made by 4,367 unique NYSE-, Amex-, and Nasdaq-listed firms between January 2006 and December 2015. Year-quarter fixed effects are included in the regression, but are not reported. Standard errors are clustered by firm and calendar year-quarter. T-statistics are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Marginal effects (in minutes) are based on a one standard deviation (one unit) increase in each continuous (binary) determinant relative to the sample mean of 594 minutes.

Table 3: Analysis of Street Earnings Activation Delay.

Panel B: FDP Queuing Behavior and Street Earnings Activation Delay

	(1)	(2)	(3)
General Visibility	−0.098***	−0.088***	−0.089***
	(−5.10)	(−4.39)	(−4.46)
Inst. Investor Visibility	−0.069***	−0.077***	−0.077***
	(−3.71)	(−3.86)	(−3.84)
Ln(Unactivated Actuals)	0.206***	0.207***	0.207***
	(6.12)	(6.19)	(6.19)
Ln(Unactivated Actuals)×General Visibility	−0.036***		−0.001
	(−4.19)		(−0.04)
Ln(Unactivated Actuals)×Inst. Investor Visibility		−0.046***	−0.046***
		(−4.92)	(−3.09)
Controls	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes
Observations	67,908	67,908	67,908
Adj. R^2	0.502	0.503	0.503

This panel reports the estimated coefficients from a regression of *Ln(Activation delay)* on the number of earnings announcements in TR's activation queue, *Ln(Unactivated actuals)*, and its interaction with measures of firm visibility - *General Visibility* and *Inst. Investor Visibility*. Controls include all other variables reported in Column (1) of Table 3, Panel A and are suppressed for brevity. Year-quarter fixed effects are included in each regression, but are not reported. Variable definitions are provided in Appendix A.1. The sample includes 67,908 quarterly earnings announcements made by 4,367 unique NYSE-, Amex-, and Nasdaq-listed firms between January 2006 and December 2015. Standard errors are clustered by firm and calendar year-quarter. T-statistics are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 4: Market Reaction Timeliness of Earnings (MRT).

Panel A: *Effects of IBES Methodology Change on MRT.*

	(1) *Full Sample*	(2) *High and Low Delay Deciles*
Unexpected Item	−0.170**	−0.375***
	(−2.56)	(−2.75)
Post	0.054	−0.106
	(1.09)	(−1.15)
Post × *Unexpected Item*	0.144**	0.431***
	(2.46)	(3.17)
Controls	Yes	Yes
Firm FE	Yes	Yes
Observations	59,257	12,441
Adj. R^2	0.027	0.045

Panel B: *Placebo Tests of the Effects of IBES Methodology Change on MRT.*

Average Coef. Est.	(1) *Random Treatment*	(2) *Random Shock*
Unexpected Item	−0.013	−0.086
	(0.01)	(−1.57)
Post	0.105*	0.045
	(1.86)	(0.97)
Post × *Unexpected Item*	0.001	0.055
	(0.03)	(0.91)
Controls	Yes	Yes
Firm FE	Yes	Yes
Observations	59,257	52,981
Average Adj. R^2	0.026	0.027

Panel A reports the estimated coecients from a regression of *MRT[0, 5]* on *Unexpected Item*, indicator variable for IBES methodology change, *Post*, interaction between *Unexpected Item* and *Post*, and controls. Column (1) of Panel B reports results for the full sample, while Column (2) reports results for a subsample of firms in the highest and lowest activation delay deciles. Panel B reports the average coefficient estimates and t-statistics of placebo tests of manipulating the treatment group, *Unexpected Item*, and the time period of the IBES methodology change, *Post*. In Column (1) of Panel B, *Unexpected Item* is the average coefficient estimate corresponding to 100 random assignments of firms into treated (*Unexpected Item* = 1) and control groups (*Unexpected Item* = 0). In Column (2) of Panel B, *Post* is the average coefficient estimate corresponding to random assignments (based on year-quarter) of observations into pre- and post- periods, excluding all observations in 2009 (the year of the methodology change). In all panels, control variables are the same as in Table 3 and are defined in Appendix A.1. Calendar year-quarter and firm fixed effects are included in Panels A and B, but are not reported. ***, **, * indicate signicance at the 1%, 5%, and 10% levels, respectively, using the two-tailed t-test. Standard errors are clustered by firm and calendar year-quarter.

Table 5: Intraday Price Discovery around Earnings Announcements and their Subsequent I/B/E/S Activations.

	(1)		(2)		(3)	
	All announcements		7AM announcements		4PM announcements	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
pre_ANN_{-8}	-0.002^{**}	(-2.06)	0.000	(0.07)	-0.003^{*}	(-1.95)
pre_ANN_{-7}	-0.001	(-1.11)	0.001	(0.95)	-0.003^{*}	(-1.90)
pre_ANN_{-6}	-0.000	(-0.32)	0.000	(0.50)	-0.001	(-0.46)
pre_ANN_{-5}	-0.002	(-1.62)	0.000	(0.48)	-0.005^{**}	(-2.33)
pre_ANN_{-4}	-0.002^{**}	(-2.55)	0.001	(0.98)	-0.004^{**}	(-2.33)
pre_ANN_{-3}	-0.001	(-1.44)	0.002	(1.53)	-0.003^{*}	(-1.69)
pre_ANN_{-2}	0.000	(0.14)	0.003^{*}	(1.88)	0.000	(0.02)
pre_ANN_{-1}	-0.003^{***}	(-3.31)	-0.001	(-0.43)	-0.002	(-0.80)
$post\_ANN_{+1}$	0.057^{***}	(22.48)	0.031^{***}	(7.70)	0.091^{***}	(21.05)
$post\_ANN_{+2}$	0.009^{***}	(6.36)	0.004^{*}	(1.91)	0.018^{***}	(6.76)
$post\_ANN_{+3}$	0.014^{***}	(8.57)	0.010^{***}	(3.70)	0.018^{***}	(7.23)
$post\_ANN_{+4}$	0.007^{***}	(4.62)	0.009^{***}	(3.13)	0.011^{***}	(4.98)
$post\_ANN_{+5}$	0.005^{***}	(3.90)	0.023^{***}	(6.37)	0.003^{*}	(1.68)
$post\_ANN_{+6}$	0.005^{***}	(3.69)	0.006^{**}	(2.14)	0.005^{***}	(2.95)
$post\_ANN_{+7}$	0.014^{***}	(8.92)	0.009^{***}	(2.70)	0.002	(1.28)
$post\_ANN_{+8}$	0.004^{***}	(3.30)	0.014^{***}	(3.68)	0.001	(1.01)
pre_ACT_{-8}	0.001	(0.75)	-0.000	(-0.15)	0.001	(0.58)
pre_ACT_{-7}	-0.000	(-0.53)	-0.001	(-1.16)	-0.001	(-0.75)
pre_ACT_{-6}	0.001	(1.04)	-0.000	(-0.16)	0.002	(0.99)
pre_ACT_{-5}	-0.000	(-0.13)	-0.001	(-0.57)	-0.000	(-0.21)
pre_ACT_{-4}	-0.001	(-0.76)	-0.001	(-0.66)	-0.002	(-1.36)
pre_ACT_{-3}	-0.000	(-0.34)	-0.003^{*}	(-1.84)	0.001	(0.47)
pre_ACT_{-2}	-0.000	(-0.25)	-0.002	(-0.91)	-0.002	(-1.16)
pre_ACT_{-1}	0.010^{***}	(6.92)	0.010^{***}	(3.38)	0.008^{***}	(3.31)
$post\_ACT_{+1}$	0.017^{***}	(9.74)	0.020^{***}	(5.51)	0.019^{***}	(6.43)
$post\_ACT_{+2}$	0.008^{***}	(5.41)	0.011^{***}	(3.63)	0.006^{**}	(2.57)
$post\_ACT_{+3}$	0.007^{***}	(4.44)	0.019^{***}	(5.56)	0.002	(1.14)
$post\_ACT_{+4}$	0.007^{***}	(4.90)	0.009^{**}	(2.41)	0.004^{**}	(2.13)
$post\_ACT_{+5}$	0.006^{***}	(4.07)	0.008^{***}	(2.60)	0.003^{**}	(2.02)
$post\_ACT_{+6}$	0.004^{***}	(2.78)	0.004	(1.22)	0.005^{***}	(3.02)
$post\_ACT_{+7}$	0.004^{***}	(2.79)	0.007^{*}	(1.73)	0.002	(1.33)
$post\_ACT_{+8}$	0.005^{***}	(3.89)	0.005	(1.30)	0.002^{*}	(1.80)

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Year-Quarter FE	Included	Included	Included
Hourly fixed effects	Included	Included	Included
$\sum_{i=1}^{4}\theta_i - \sum_{i=-4}^{-1}\delta_i$	0.030^{***}	0.055^{***}	0.026^{***}
	(46.06)	(29.21)	(17.05)
# of announcements	36,347	7,283	16,818
# of observations	4,652,416	932,224	2,152,704
Adjusted R^2 (%)	0.7	1.5	0.8

This table presents the results from Ordinary Least Squares (OLS) estimation of the following regression equation:

$$RPD_t = \alpha_{FE} + \sum_{i=-16}^{-1} \beta_i Pre\_ANN_i + \sum_{i=1}^{16} \gamma_i Post\_ANN_i + \sum_{i=-16}^{-1} \delta_i Pre\_ACT_i + \sum_{i=1}^{16} \theta_i Post\_ACT_i + \varepsilon,$$

where the relative price discovery (RPD_t) for each 15-minute interval t over the two days window ([-960, +960] trading minutes) surrounding an earnings announcement is defined as $RPD_t = \frac{log(1+ret_{15\_trading\_min})}{log(1+ret_{[-960,+960]})}$, Pre_ANN_i equals one for the ith 15-minute pre-announcement interval, $Post\_ANN_i$ equals one for the ith 15-minute post-announcement interval, and Pre_ACT_i and $Post\_ACT_i$ are similarly defined for the pre- and post-activation intervals. To facilitate exposition, we tabulate only coefficients for the 8 pre- and 8 post-indicators around each event. We also include but do not tabulate year-quarter and hourly time-of-day fixed effects in each regression. Following Li et al. (2015) and Akbas et al. (2018), we use TAQ data to examine trading during both regular and extended trading hours, such that a full trading day covers 960 trading minutes (4:00AM to 8:00PM). For trading occurring during regular trading hours, we keep only trades that meet all of the following criteria: (1) trades occurring on the NYSE, Amex, or Nasdaq; (2) trades made under regular market conditions (i.e., COND codes ' ','*','@','E','F','@F','6','@6','M','O'); (3) trades without subsequent cancellations; and (4) trades where the transaction price and the number of shares traded were both positive. For trades during extended trading hours, we include trades with COND codes 'T','F','@', and '@F', which represent the bulk of all extended-hour trades. In terms of EX codes, we exclude extended-hour trades in NYSE and Amex as they are likely to represent regular session closing transactions that are reported after 4PM As in Li et al. (2015) and Akbas et al. (2018), we winsorize RPD_t at -1 and 1 to mitigate the effect of extreme observations. t-statistics based on standard errors clustered by firm and announcement date are reported beside each coefficient estimate. Separate regressions are estimated for all press releases (full sample), press releases announced between 7:00AM – 7:59AM (7AM subsample), and press releases announced between 4:00PM – 4:59PM (4PM subsample). Wald tests of the (two-sided) hypothesis $\sum_{i=1}^{4}\theta_i Post\_ACT_i - \sum_{i=-4}^{-1}\theta_i Pre\_ACT_i = 0$ are presented below each regression, with F-statistics displayed in parentheses below the differences in coefficients. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 6: I/B/E/S Activation Delay and Analyst Responsiveness to Earnings News

	(IV)		(OLS)
	First Stage	Second Stage	
	(1)	(2)	(3)
Ln(Activation Delay)		0.195***	0.042***
		(5.03)	(10.04)
Ln(Unactivated Actuals)	0.180***		
	(5.03)		
Controls	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes
Observations	41,403	41,403	41,403
Adj. R^2	0.212	0.246	0.293
Partial R-squared (instr.)		0.031	
Under-identification			
Kleibergen-Paap			
Robust χ^2*-statistics*	11.12		
Weak Indentification			
Kleibergen-Paap Wald			
Robust F-statistics	25.29		

This table shows the estimated coefficients from a regression of analyst forecast delay (*Analyst Delay*) on the earnings activation delay (*Ln(Activation Delay)*), other firm characteristics, and year-quarter fixed effects. *Analyst Delay* is the natural logarithm of the average time (in minutes) from the firm's earnings announcement until an analyst issues a forecast of next quarter earnings over the six-day ([0,5]) window after the earnings announcement. *Controls* is the vector of control variables used in Eq.(1) as well as *8K Filing Lag*, *Conference Call*, *Conference Call Lag*, *Firm Specific Experience*, and *Broker Size*. All variables are defined in Appendix A.1. All continuous independent variables are standardized to have a mean of 0 and standard deviation of 1. Columns (1) and (2) report the first and second stages of the two-stage least squares (2SLS) instrumental variables estimation, respectively. Column (3) reports the estimated coefficients using the Ordinary Least Squares (OLS) method. The sample includes 41,403 firm-quarters observations corresponding to the post-September 2009 time period, where at least one analyst issues a forecast within the six-day window following the earnings announcement. The sample includes 3,537 unique NYSE-, Amex-, and Nasdaq-listed firms. Standard errors are clustered by firm and calendar year-quarter. T-statistics are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. The Kleibergen-Paap Wald F-statistics for weak instruments and the Kleibergen-Paap χ^2 statistics for under-identification are provided for the first stage specification of IV.

Internet Appendix

Could a Sophisticated Investor Profit from Street Earnings Activation Delay?

The results in Section 4 are consistent with a delayed market response to earnings news for announcements with longer street earnings activation delay. This suggests that investors with the ability to process earnings news more quickly than FDPs may be able to profit from this delayed market response. Given that the median activation delay in our post-2009Q3 subsample is 23 minutes, potential arbitrage opportunities are likely short-lived. Therefore, we use intraday pricing data to examine whether a hypothetical investor could profit from street earnings activation delay. We estimate the trading profits to an implementable trading strategy in which an investor enters a position during the first 15 trading-minutes following an earnings press release and closes the position after one trading-day.[37]

Specifically, we examine whether the profits to buying (selling) good (bad) earnings news vary with expected street earnings activation delay. We posit that the profits to trading on earnings news should be larger when street earnings activation takes longer. Intuitively, to the extent that earnings news is impounded in price less quickly following announcements with longer activation delays, investors with a timing advantage can profit by trading at advantageous prices before earnings news is fully impounded by the market. Furthermore, our results from Section 3 suggest that investors can use our model of street earnings activation delay in Eq. (1) to identify press releases with longer *expected* activation delay, allowing them to invest in stocks with longer *expected* activation delay *before* activation occurs.[38]

Accordingly, each quarter we sort earnings press releases into earnings news and ex-

[37]The trading strategy we examine is implementable for sophisticated investors who have the ability to quickly process and trade on earnings news. Our analysis relies solely on information available at the time of the press release. However, some commercially available data used in our analysis would need to be purchased by an investor wishing to implement our strategy. Similar results could likely be obtained using only publicly available information.

[38]We discussed our study with a director at a large brokerage house who was aware of hedge funds that already engage in trading strategies based on predicting FDP street earnings activation delay.

pected delay quintiles using cutoff points from the prior four quarters. We estimate expected delay using rolling regressions of Eq. (1), excluding *Post* and its interaction term, such that expected delay is computed by multiplying the independent variables for a given press release with the coefficients from the pooled regression estimated using the previous four quarters of data.[39] We predict that the hedge return to buying (selling) the highest (lowest) earnings news (i.e., *Surprise*) quintile will be greater for earnings announcements in the highest (i.e., longest) expected delay quintile relative to the lowest (i.e., shortest) expected delay quintile.

To control for transactions costs, we follow Green (2006) and use volume-weighted average transactions prices (VWAP) to determine the opening and closing price for each trading position.[40] Positions are assumed to be entered into at the VWAP during the first 15 minutes after an earnings press release and unwound at the VWAP during the last two hours of the one trading-day holding period (Green, 2006). Trading minutes include extended-hours trading.[41] To provide estimates that are more relevant to the current data activation environment, we limit the estimation sample to press releases with announcement dates after the 2009 I/B/E/S methodology change.[42]

Table IA.1 presents the estimated profits for each portfolio, stated as mean percentage returns. Differences in returns between the good and bad news *Surprise* quintiles (Good-Bad) are presented for all observations (All), those in the lowest and highest expected delay quintiles, and a hedge (High-Low) portfolio. t-statistics in parenthesis below each return difference are calculated based on standard errors clustered by firm and event date. Unconditionally, the estimated one-day return to the hedge strategy of buying (selling) good (bad) earnings news is 5.418% (t-stat=20.44). In comparison, the same strategy is estimated to yield 6.831% (t-stat=10.39) and 4.319% (t-stat=7.52) for press releases in the highest and

[39]Similarly, the resulting expected delay is sorted into its corresponding quintile based on the distribution of in-sample predicted values from the pooled regression.

[40]In contrast to prices from quoted spreads, VWAP take into account the price impact of trading. Green (2006) notes that the price impact of trading is the primary relevant transaction cost for institutional traders.

[41]For example, purchases following a 4:00PM earnings announcement are assumed to occur at the extended hours VWAP from 4:00 – 4:15PM and to be unwound at the VWAP between 2:00PM – 4:00PM the following trading day.

[42]Inferences remain unchanged if we include observations prior to September 30, 2009 (untabulated).

lowest expected delay quintiles, respectively. The difference in returns of 2.512% is economically meaningful and statistically significant at the 1% level (t-stat=2.91). These results suggest that our model of expected activation delay (Eq.1) is useful to investors, and more generally, that investors can profit from incorporating expected activation delay in their trading response to earnings news.

Table IA.1: Estimated Trading Profits

Expected Delay / *Surprise*	**All**	**Low Delay**	**High Delay**	**High - Low**
Bad News	-3.314% [2,488]	-2.607% [308]	-3.639% [551]	-1.032%* (-1.65)
Good News	2.103% [3,088]	1.712% [649]	3.192% [454]	1.480%** (2.54)
Good - Bad	5.418%*** (20.44)	4.319%*** (7.52)	6.831%*** (10.39)	2.512%*** (2.91)

This table reports equal-weighted average returns to portfolios that go long (short) in good (bad) news stocks over a one trading-day (960 trading minute) holding period. Each quarter, earnings announcements are independently sorted into earnings news and expected delay quintiles using cutoff points from historical data for the prior four quarters. Earnings news refers to *Surprise* (as defined in Appendix A.1) and expected delay is calculated from rolling regressions of Eq. (1), excluding *Post* and its interaction term. Positions are assumed to be entered into at the volume-weighted average price during the first 15 minutes after an earnings press release announcement and unwound at the volume-weighted average price during the last two hours of the holding period (Green, 2006). Trading minutes include extended-hours trading, following the TAQ data collection procedure described in Table 5. The estimation sample includes 14,893 quarterly earnings announcements from the full sample with announcement dates after September 30, 2009, with at least one trade occurring during the first 15 trading minutes of the holding period and at least one trade occurring during the final two hours of the holding period. t-statistics in parenthesis below each difference are calculated based on standard errors clustered by firm and event date.